

The Archdruid Report

Druid perspectives on nature, culture, and the future of industrial society

Wednesday, March 26, 2014

Captain Erikson's Equation

I have yet to hear anyone in the peak oil blogosphere mention the name of Captain Gustaf Erikson of the Åland Islands and his fleet of windjammers. For all I know, he's been completely forgotten now, his name and accomplishments packed away in the same dustbin of forgotten history as solar steam-engine pioneer Augustin Mouchot, his near contemporary. If so, it's high time that his footsteps sounded again on the quarterdeck of our collective imagination, because his story—and the core insight that committed him to his lifelong struggle—both have plenty to teach about the realities framing the future of technology in the wake of today's era of fossil-fueled abundance.



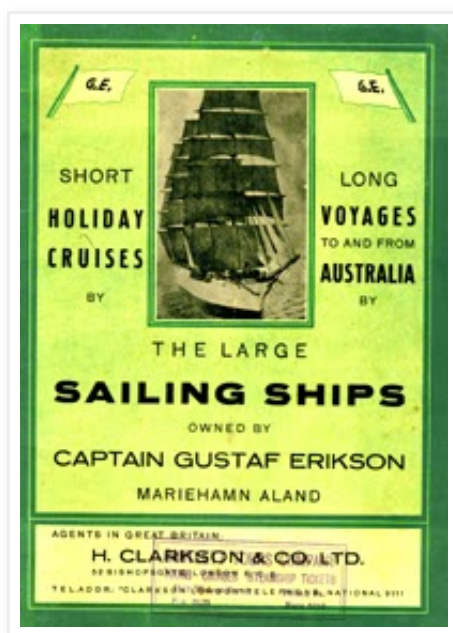
Erikson, born in 1872, grew up in a seafaring family and went to sea as a ship's boy at the age of nine. At 19 he was the skipper of a coastal freighter working the Baltic and North Sea ports; two years later he shipped out as mate on a windjammer for deepwater runs to Chile and Australia, and eight years after that he was captain again, sailing three- and four-masted cargo ships to the far reaches of the planet. A bad fall from the rigging in 1913 left his right leg crippled, and he left the sea to become a shipowner instead, buying the first of what would become the 20th century's last major fleet of windpowered commercial cargo vessels.

It's too rarely remembered these days that the arrival of steam power didn't make commercial sailing vessels obsolete across the board. The ability to chug along at eight knots or so without benefit of wind was a major advantage in some contexts—naval vessels and

passenger transport, for example—but coal was never cheap, and the long stretches between coaling stations on some of the world's most important trade routes meant that a significant fraction of a steamship's total tonnage had to be devoted to coal, cutting into the capacity to haul paying cargoes. For bulk cargoes over long distances, in particular, sailing ships were a good deal more economical all through the second half of the 19th century, and some runs remained a paying proposition for sail well into the 20th.

That was the niche that the windjammers of the era exploited. They were huge—up to 400 feet from stem to stern—square-sided, steel-hulled ships, fitted out with more than an acre of canvas and miles of steel-wire rigging. They could be crewed by a few dozen sailors, and hauled prodigious cargoes: up to 8,000 tons of Australian grain, Chilean nitrate—or, for that matter, coal; it was among the ironies of the age that the coaling stations that allowed steamships to refuel on long voyages were very often kept stocked by tall ships, which could do the job more economically than steamships themselves could. The markets where wind could outbid steam were lucrative enough that at the beginning of the 20th century, there were still thousands of working windjammers hauling cargoes across the world's oceans.

That didn't change until bunker oil refined from petroleum ousted coal as the standard fuel for powered ships. Petroleum products carry much more energy per pound than even the best grade of coal, and the better grades of coal were beginning to run short and rise accordingly in price well before the heyday of the windjammers was over. A diesel-powered vessel had to refuel less often, devote less of its tonnage to fuel, and cost much less to operate than its coal-fired equivalent. That's why Winston Churchill, as head of Britain's Admiralty, ordered the entire British Navy converted from coal to oil in the years just before the First World War, and why coal-burning steamships became hard to find anywhere on the seven seas once the petroleum revolution took place. That's also why most windjammers went out of use around the same time; they could compete against coal, but not against dirt-cheap diesel fuel.



Gustav Erikson went into business as a shipowner just as that transformation was getting under way. The rush to diesel power allowed him to buy up windjammers at a fraction of

their former price—his first ship, a 1,500-ton bark, cost him less than \$10,000, and the pride of his fleet, the four-masted *Herzogin Cecilie*, set him back only \$20,000. A tight rein on operating expenses and a careful eye on which routes were profitable kept his firm solidly in the black. The bread and butter of his business came from shipping wheat from southern Australia to Europe; Erikson's fleet and the few other windjammers still in the running would leave European ports in the northern hemisphere's autumn and sail for Spencer Gulf on Australia's southern coast, load up with thousands of tons of wheat, and then race each other home, arriving in the spring—a good skipper with a good crew could make the return trip in less than 100 days, hitting speeds upwards of 15 knots when the winds were right.

There was money to be made that way, but Erikson's commitment to the windjammers wasn't just a matter of profit. A sentimental attachment to tall ships was arguably part of the equation, but there was another factor as well. In his latter years, Erikson was fond of telling anyone who would listen that a new golden age for sailing ships was on the horizon: sooner or later, he insisted, the world's supply of coal and oil would run out, steam and diesel engines would become so many lumps of metal fit only for salvage, and those who still knew how to haul freight across the ocean with only the wind for power would have the seas, and the world's cargoes, all to themselves.

Those few books that mention Erikson at all like to portray him as the last holdout of a departed age, a man born after his time. On the contrary, he was born before his time, and lived too soon. When he died in 1947, the industrial world's first round of energy crises were still a quarter century away, and only a few lonely prophets had begun to grasp the absurdity of trying to build an enduring civilization on the ever-accelerating consumption of a finite and irreplaceable fuel supply. He had hoped that his sons would keep the windjammers running, and finish the task of getting the traditions and technology of the tall ships through the age of fossil fuels and into the hands of the seafarers of the future. I'm sorry to say that that didn't happen; the profits to be made from modern freighters were too tempting, and once the old man was gone, his heirs sold off the windjammers and replaced them with diesel-powered craft.

Erikson's story is worth remembering, though, and not simply because he was an early prophet of what we now call peak oil. He was also one of the very first people in our age to see past the mythology of technological progress that dominated the collective imagination of his time and ours, and glimpse the potentials of one of the core strategies this blog has been advocating for the last eight years.

We can use the example that would have been dearest to his heart, the old technology of windpowered maritime cargo transport, to explore those potentials. To begin with, it's crucial to remember that the only thing that made tall ships obsolete as a transport technology was cheap abundant petroleum. The age of coal-powered steamships left plenty of market niches in which windjammers were economically more viable than steamers. The difference, as already noted, was a matter of energy density—that's the technical term for how much energy you get out of each pound of fuel; the best grades of coal have only about half the energy density of petroleum distillates, and as you go down the scale of coal grades, energy

density drops steadily. The brown coal that's commonly used for fuel these days provides, per pound, rather less than a quarter the heat energy you get from a comparable weight of bunker oil.

As the world's petroleum reserves keep sliding down the remorseless curve of depletion, in turn, the price of bunker oil—like that of all other petroleum products—will continue to move raggedly upward. If Erikson's tall ships were still in service, it's quite possible that they would already be expanding their market share; as it is, it's going to be a while yet before rising fuel costs will make it economical for shipping firms to start investing in the construction of a new generation of windjammers. Nonetheless, as the price of bunker oil keeps rising, it's eventually going to cross the line at which sail becomes the more profitable option, and when that happens, those firms that invest in tall ships will profit at the expense of their old-fashioned, oil-burning rivals.

Yes, I'm aware that this last claim flies in the face of one of the most pervasive superstitions of our time, the faith-based insistence that whatever technology we happen to use today must always and forever be better, in every sense but a purely sentimental one, than whatever technology it replaced. The fact remains that what made diesel-powered maritime transport standard across the world's oceans was not some abstract superiority of bunker oil over wind and canvas, but the simple reality that for a while, during the heyday of cheap abundant petroleum, diesel-powered freighters were more profitable to operate than any of the other options. It was always a matter of economics, and as petroleum depletion tilts the playing field the other way, the economics will change accordingly.

All else being equal, if a shipping company can make larger profits moving cargoes by sailing ships than by diesel freighters, coal-burning steamships, or some other option, the sailing ships will get the business and the other options will be left to rust in port. It really is that simple. The point at which sailing vessels become economically viable, in turn, is determined partly by fuel prices and partly by the cost of building and outfitting a new generation of sailing ships. Erikson's plan was to do an end run around the second half of that equation, by keeping a working fleet of windjammers in operation on niche routes until rising fuel prices made it profitable to expand into other markets. Since that didn't happen, the lag time will be significantly longer, and bunker fuel may have to price itself entirely out of certain markets—causing significant disruptions to maritime trade and to national and regional economies—before it makes economic sense to start building windjammers again.

It's a source of wry amusement to me that when the prospect of sail transport gets raised, even in the greenest of peak oil circles, the immediate reaction from most people is to try to find some way to smuggle engines back onto the tall ships. Here again, though, the issue that matters is economics, not our current superstitious reverence for loud metal objects. There were plenty of ships in the 19th century that combined steam engines and sails in various combinations, and plenty of ships in the early 20th century that combined diesel engines and sails the same way. Windjammers powered by sails alone were more economical than either of these for long-range bulk transport, because engines and their fuel supplies cost money, they take up tonnage that can otherwise be used for paying cargo, and their fuel costs cut

substantially into profits as well.

For that matter, I've speculated in posts here about the possibility that Augustin Mouchot's solar steam engines, or something like them, could be used as a backup power source for the windjammers of the deindustrial future. It's interesting to note that the use of renewable energy sources for shipping in Erikson's time wasn't limited to the motive power provided by sails; coastal freighters of the kind Erikson skippered when he was nineteen were called "onkers" in Baltic Sea slang, because their windmill-powered deck pumps made a repetitive "onk-urrr, onk-urrr" noise. Still, the same rule applies; enticing as it might be to imagine sailors on a becalmed windjammer hauling the wooden cover off a solar steam generator, expanding the folding reflector, and sending steam down belowdecks to drive a propeller, whether such a technology came into use would depend on whether the cost of buying and installing a solar steam engine, and the lost earning capacity due to hold space being taken up by the engine, was less than the profit to be made by getting to port a few days sooner.

Are there applications where engines are worth having despite their drawbacks? Of course. Unless the price of biodiesel ends up at astronomical levels, or the disruptions ahead along the curve of the Long Descent cause diesel technology to be lost entirely, tugboats will probably have diesel engines for the imaginable future, and so will naval vessels; the number of major naval battles won or lost in the days of sail because the wind blew one way or another will doubtless be on the minds of many as the age of petroleum winds down. Barring a complete collapse in technology, in turn, naval vessels will no doubt still be made of steel—once cannons started firing explosive shells instead of solid shot, wooden ships became deathtraps in naval combat—but most others won't be; large-scale steel production requires ample supplies of coke, which is produced by roasting coal, and depletion of coal supplies in a postpetroleum future guarantees that steel will be much more expensive compared to other materials than it is today, or than it was during the heyday of the windjammers.

Note that here again, the limits to technology and resource use are far more likely to be economic than technical. In purely technical terms, a maritime nation could put much of its arable land into oil crops and use that to keep its merchant marine fueled with biodiesel. In economic terms, that's a nonstarter, since the advantages to be gained by it are much smaller than the social and financial costs that would be imposed by the increase in costs for food, animal fodder, and all other agricultural products. In the same way, the technical ability to build an all-steel merchant fleet will likely still exist straight through the deindustrial future; what won't exist is the ability to do so without facing prompt bankruptcy. That's what happens when you have to live on the product of each year's sunlight, rather than drawing down half a billion years of fossil photosynthesis: there are hard economic limits to how much of anything you can produce, and increasing production of one thing pretty consistently requires cutting production of something else. People in today's industrial world don't have to think like that, but their descendants in the deindustrial world will either learn how to do so or perish.

This point deserves careful study, as it's almost always missed by people trying to think their way through the technological consequences of the deindustrial future. One reader of mine

who objected to talk about abandoned technologies in a previous post quoted with approval the claim, made on another website, that if a deindustrial society can make one gallon of biodiesel, it can make as many thousands or millions of gallons as it wants. Technically, maybe; economically, not a chance. It's as though you made \$500 a week and someone claimed you could buy as many bottles of \$100-a-bottle scotch as you wanted; in any given week, your ability to buy expensive scotch would be limited by your need to meet other expenses such as food and rent, and some purchase plans would be out of reach even if you ignored all those other expenses and spent your entire paycheck at the liquor store. The same rule applies to societies that don't have the windfall of fossil fuels at their disposal—and once we finish burning through the fossil fuels we can afford to extract, every human society for the rest of our species' time on earth will be effectively described in those terms.

The one readily available way around the harsh economic impacts of fossil fuel depletion is the one that Gunnar Erikson tried, but did not live to complete—the strategy of keeping an older technology in use, or bringing a defunct technology back into service, while there's still enough wealth sloshing across the decks of the industrial economy to make it relatively easy to do so. I've suggested above that if his firm had kept the windjammers sailing, scraping out a living on whatever narrow market niche they could find, the rising cost of bunker oil might already have made it profitable to expand into new niches; there wouldn't have been the additional challenge of finding the money to build new windjammers from the keel up, train crews to sail them, and get ships and crews through the learning curve that's inevitably a part of bringing an unfamiliar technology on line.

That same principle has been central to quite a few of this blog's projects. One small example is the encouragement I've tried to give to the rediscovery of the slide rule as an effective calculating device. There are still plenty of people alive today who know how to use slide rules, plenty of books that teach how to crunch numbers with a slipstick, and plenty of slide rules around. A century down the line, when slide rules will almost certainly be much more economically viable than pocket calculators, those helpful conditions might not be in place—but if people take up slide rules now for much the same reasons that Erikson kept the tall ships sailing, and make an effort to pass skills and slipsticks on to another generation, no one will have to revive or reinvent a dead technology in order to have quick accurate calculations for practical tasks such as engineering, salvage, and renewable energy technology.

The collection of sustainable-living skills I somewhat jocularly termed “green wizardry,” which I learned back in the heyday of the appropriate tech movement in the late 1970s and early 1980s, passed on to the readers of this blog in a series of posts a couple of years ago, and have now explored [in book form as well](#), is another case in point. Some of that knowledge, more of the attitudes that undergirded it, and nearly all the small-scale, hands-on, basement-workshop sensibility of the movement in question has vanished from our collective consciousness in the years since the Reagan-Thatcher counterrevolution foreclosed any hope of a viable future for the industrial world. There are still enough books on appropriate tech gathering dust in used book shops, and enough in the way of living memory among those of us who were there, to make it possible to recover those things; another

generation and that hope would have gone out the window.

There are plenty of other possibilities along the same lines. For that matter, it's by no means unreasonable to plan on investing in technologies that may not be able to survive all the way through the decline and fall of the industrial age, if those technologies can help cushion the way down. Whether or not it will still be possible to manufacture PV cells at the bottom of the deindustrial dark ages, [as I've been pointing out since the earliest days of this blog](#), getting them in place now on a home or local community scale is likely to pay off handsomely when grid-based electricity becomes unreliable, as it will. The modest amounts of electricity you can expect to get from this and other renewable sources can provide critical services (for example, refrigeration and long-distance communication) that will be worth having as the Long Descent unwinds.

That said, all such strategies depend on having enough economic surplus on hand to get useful technologies in place before the darkness closes in. As things stand right now, as many of my readers will have had opportunity to notice already, that surplus is trickling away. Those of us who want to help make a contribution to the future along those lines had better get a move on.

John Michael Greer at 5:15 PM

Share



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229 comments:



Ventriloquist 3/26/14, 5:31 PM

So, now we have validation.

Or, maybe even . . . ignition?

Not from some "out there, fringe source".

But from NASA. From the National Aeronautics and Space Administration. Yes, that one.

Seems they have just released a study that specifies -- Industrial Civilization may be headed for 'irreversible collapse'

You go girl! Read it and weep:

[http://www.theguardian.com/environment/earth-insight/2014/mar/14/nasa-civilisation-irreversible-](http://www.theguardian.com/environment/earth-insight/2014/mar/14/nasa-civilisation-irreversible-collapse-study-scientists)

[collapse-study-scientists](http://www.theguardian.com/environment/earth-insight/2014/mar/14/nasa-civilisation-irreversible-collapse-study-scientists)

Same damn thing that JMG, JHK, DO, CM, NF, et al, have been saying . . . lo these many years.

Wrapped up like a nice little bunny . . . except this Easter Basket comes from a not-inconsequential source,

and it ain't pretty.

[Reply](#)



Pongo 3/26/14, 6:00 PM

I grew up on an island off the coast of Maine, and in the eighteenth and nineteenth centuries (and well into the first part of the twentieth) most of the able-bodied men earned their living from the sea. That included practically every man in my own family up to and including my late grandfather. My father was the one who broke the chain, he went into education and I went into the arts.

And what amazed me, when I first started to learn about it, was the fact that relatively few of these men (my family and otherwise) were simple fishermen and lobstermen. Mainers have reputations as bumpkins and we like to believe that we are more worldly and sophisticated, but I had my doubts after reading accounts from many of these men, who crewed sailing ships that took them all over the world - the Caribbean and South America (especially Brazil and Cuba), the coast of West Africa, Egypt, Turkey, etc. I happen to have a couple of my great-grandfather's logbooks, with handwritten notations about trips to Iceland, Scotland and Scandinavia.

What gives some feeling of optimism is the fact that today, in my hometown and in the surrounding area, the skill set necessary to build and operate sailing ships is not completely lost. Sailing - real sailing, as it's not considered sporting to use the inboard motor except for emergencies - is still a popular hobby. There are also still a few people who know and practice the art of building wooden sailing ships. Right now there is even a fundraising effort underway for a documentary about one of them. That's typical of the place, as it has an enormous cottage industry of local historians who are documenting the region's maritime history. They usually do so for reasons that are more nostalgic than practical, but I get the feeling that future generations will be grateful that they managed to preserve and document as much as they have.

[Reply](#)



Paul 3/26/14, 6:03 PM

I know I've seen stuff about the modern day equivalent of the old windjammers - computer controlled, wind assisted bulk cargo vessels. We may not have the energy in the future, but we would still have technology that wasn't available a century ago. Sails that are controlled by computers, and raised and lowered using solar powered motors, thus keeping labour costs to a minimum? Why not? Not so much steampunk as sailpunk I suppose.

I googled the computer controlled cargo sailing ship thing and came across a magazine, Popular Science. The issue was dated June 1985, and contained such far fetched fantasies as "A new auto-

navigation system provides a CRT with scrolling maps that accurately guide you to your destination". They predicted the concept, but not the execution. They couldn't foresee flat screens or satellite navigation. Their system used existing methods of accelerometers and cathode ray tubes. There was a cassette tape player involved somewhere too.

And there, on page 88, is an article about the "Wingsail". "The rising cost of diesel fuel has spurred numerous attempts to restore sails to commercial ships", it begins...

[Reply](#)



Odin's Raven 3/26/14, 6:04 PM

Here's another entry for the story competition. It's about 6,700 words.
I hope there's scope for a little humour.

[An Angelic Examination](#)

[Reply](#)



Kyoto Motors 3/26/14, 6:05 PM

Hi Mr. Greer,

Nice to be among the first to comment.

Nice bit of history you've brought up. My first thoughts turned to a business article I read about fifteen years ago, where investors were being courted to revive dirigibles and a fuel efficient air-cargo fleet. Nothing seems to have come of it, but I always wished that there was some prescience to what I read, and we'd see airships again by now. Who knows, maybe yet... I suppose one major limiting factor would be helium.

Thanks again. I look forward to the discussion here.

[Reply](#)



Jose Coces 3/26/14, 6:08 PM

JMG, are there any technologies in modern medicine that you would suggest somebody should try to keep for the future?

Myself, I'm thinking about anesthetics. Ether, in particular, is not too hard to manufacture, and it is incredibly useful.

[Reply](#)



Glenn 3/26/14, 6:14 PM

Quite a few of us sailors know of Capt. Erikson. Linn and Larry Pardey mention him and his struggles in one of their books (Serrafyn's European Adventure). Many of his crews were unpaid "cadets" or even paid him for the privilege of their on deck education. In the end, even he couldn't compete with cheap oil.

I agree with your analysis though, he just didn't live long enough. In some parts of the non-

industrialized world, sail has never gone away. And it is starting to return even in Europe and America. Small ships, carrying expensive cargoes for a niche clientele, but it's a start.

Any experienced sailor will tell you an auxiliary engine is useful. A run can be dramatically shortened by the ability to motor through the doldrums or the horse latitudes. Still, one needs to do the math; is the increase in cost of engineering, fuel and the personnel to maintain and operate the machinery and the loss of cargo capacity worth the shorter voyage? As calculated over all the voyages a ship might make in it's working life?

I will note, the Pardey's, modern yachters, have never had an auxiliary on their own boats. And their passage times are no worse, and frequently better than other larger vessels equipped with power. (Their first boat was 24' and about 5 tons, their second 30' and about 10 tons). Their logic was leaving out the motor reduced the initial and maintenance cost by 25% and let them pay for materials and complete building their vessels that much quicker so they could get going. A commercial ship owner might use the same logic.

Glenn

in the Bramblepatch
Marrowstone Island
Salish Sea
Cascadia

[Reply](#)



Andrew Brown 3/26/14, 6:19 PM

Fascinating. Though I once wandered across the Åland Islands in some youthful travels, I never heard of Cpt. Erikson. Your post hits on a central tension on all of this - namely the ability to do things that aren't economical. As you note at a kind of macro-level, it's naive to think you can get stuff done if it is too counter-economical. At a more human level we are much less hemmed in by the payoff of any given activity. One of the attractions of your green wizardry is that its mission - working on some skills and technologies that make sense in an imagined future rather than today - is at a scale that motivated individuals can actually have an impact.

[Reply](#)



Robert Magill 3/26/14, 6:25 PM

Entry: Post Peak Contest

End of Evolution: a Retrospective

November, 2042

The natural evolution of life on planet Earth began to come to an end one hundred years ago on December 2, 1942 under a squash court in Chicago, Illinois, USA. The wizard who precipitated this event was the brilliant Italian physicist, Enrico Fermi.

Now the planet is de facto, bankrupt; no longer solvent. At this moment in time, the natural evolution of species is perhaps doomed to end and be replaced by worldwide genetic contamination as mankind can no longer afford to safely maintain or dispose of the countless machines and devices that have been produced since Professor Fermi released the genii by starting the first successful controlled nuclear chain reaction.

There had been opportunity for America to neuter the jinn from that day in 1942 until September 16, 1985, the day on which the USA went broke, became a debtor nation... No limits to growth were seriously considered in those halcyon days...

www.robertmagill.wordpress.com

[Reply](#)



Ruben 3/26/14, 6:33 PM

I can't wait for windjammers to come back. I am part of group that meets every two weeks to sing sea shanties, and it sure is nice to sing them outside and on the water instead of in a living room.

[Reply](#)



Joel Caris 3/26/14, 6:41 PM

Hi JMG,

Excellent post. Thank you. I've been enjoying these vignettes of late where you hammer down on an important point that people are having a hard time grasping. I find it helpful for my own thought process.

I just moved to a new place at the end of January--an old farmhouse on some land, a couple miles down the road from where I was before. I'm renting, didn't buy, but I work for the owners, am on good terms with them, and should be able to settle in and stay awhile. A good situation for me.

There are plenty of tasks for me to do here (and I'll be utilizing *Green Wizardry* as one guide) but

the most immediate is to get in garden beds. I put in my first small one on Monday, at the end of a three day stretch of sun, when the soil had dried out enough to work. I removed the sod layer with a mattock, loosened the soil with a digging fork and removed a significant number of large rocks (this is going to be quite a task, but at least I can make some nice looking beds by lining them with the excavated rocks) then incorporated in some complete organic with my 3-tooth cultivator. Finished it off by putting in some potatoes. It's a small start--a 3' x 10' bed--but it felt great to be digging in the soil and get a little food in the ground after this winter.

It was a lot of work for one small bed, though, and as I looked over the lawn and thought about all the beds I ultimately want to dig and amend and plant, I couldn't help but think how nice it will be *next* year when the beds already exist. Rather than sweating the weather, waiting for a good stretch of sun just so the soil will dry out enough so I can peel up the grass and dig up the beds--before I get around to actually planting--I'll be able to just weed the beds (regardless of rain) and then wait for the soil to dry out to do a quick loosening of the soil, amending, and planting.

The details are different, but the pattern is the same. Next year, my beds will be my fleet, carried through. This year, I have a very large investment of labor to put in before I'm ready to start growing food.

I'm excited to be settling. The last few years, I've moved each year, for various reasons. I've only moved a mile or two each time, but every year has been a restart in terms of gardening, which really is a long game and built upon annual investments. I'm glad I won't be moving again for the foreseeable future. The beds will be ready next year. I can finally grow my own garlic. And I'll be working on other infrastructure this year, too (a rebuilt chicken coop, perennials, fruit trees, a solar water batch heater, and more) to make future years easier and more LESS focused.

Anyway, I just wanted to relate that. This feels to me like perhaps your clearest explanation of the importance of the economic factor in future technology usage and the bit about carrying through a technology really struck me, as my little analogy here hopefully makes clear. Thanks.

[Reply](#)



john john 3/26/14, 6:42 PM

The movement back to ocean going sail transport is already happening
<http://svtreshombres.homestead.com/>

[Reply](#)



onething 3/26/14, 6:42 PM

The longer I live, the more I see the bizarreness of the human situation. The older I get the more I see parallels between the way dreams unfold and the way humans unfold their societal dramas. Cultures, civilizations, and their various narratives of religion and nation or tribe and its purposes, the way different societies get utterly taken up with a certain worldview with its projects and the efforts to maintain it, all the while being usually oblivious to other civilizations and their very different goals and structures, or when aware of them dismissing them with nary an inward reflection - it is so irrational, so dreamlike. Dreamlike because of the acceptance of all the

weirdness without questioning it, as one does in dreams. And dreamlike because as in dreams, we just keep the story-stream running, making it up as we go along.

Now, underneath all that there is a bedrock of reality, but because we all know deep in the subconscious that we haven't a clue what's going on, everyone is trying to figure out what is true and actual, but no one quite can. (Except for you of course, JMG.)

And it occurs to me that much like the way that most people are fairly reasonable on their own but can get swept away in a mob, so is the running of our societies like a mob with little rationality at the helm.

Anyway, this is what ran through my head as I read this post, with the contents of which I have no argument at all. Seems like switching to sail will be among the easiest and least disruptive of our coming transitions.

[Reply](#)



Pinku-Sensei 3/26/14, 6:53 PM

"A diesel-powered vessel had to refuel less often, devote less of its tonnage to fuel, and cost much less to operate than its coal-fired equivalent. That's why Winston Churchill, as head of Britain's Admiralty, ordered the entire British Navy converted from coal to oil in the years just before the First World War, and why coal-burning steamships became hard to find anywhere on the seven seas once the petroleum revolution took place."

The replacement of coal with oil as a major fuel about the time of Churchill's action had an immediate effect visible in hindsight--the reversal of decades of coal technology making carbon dioxide emissions worse than would be expected from population and affluence alone. Before 1910, the effects of technology amplify impact as signified by carbon dioxide; after 1910, the effects of technology start reducing the impact expected. One can see that change in Figures 16 and 17 at the link below. They're among the graphs I show my students when I explain the $I=P*A*T$ equation, in which population (P) and affluence (A) increase environmental impact (I) as they go up, but technology (T) can work either with or against P and A. I'll be showing my classes these figures and others from the page next week; here's to they're making as big an impression on them as they usually do.

http://www.ejsd.co/public/journal_article/11

Of course, the promise of technology decreasing or maintaining impact in the face of higher population and demand for more affluence is what motivates a lot of the "bright green" types you gently mock here. They're the ones you want to make a bargain with, one they might take you up on. Still, appropriate technology will do the same thing, even if it isn't what our society currently considers advanced technology.

" In purely technical terms, a maritime nation could put much of its arable land into oil crops and use that to keep its merchant marine fueled with biodiesel. In economic terms, that's a nonstarter, since the advantages to be gained by it are much smaller than the social and financial costs that would be imposed by the increase in costs for food, animal fodder, and all other agricultural products."

That's not stopping the U.S. when it comes to corn ethanol as fuel. Another graph I show my students is the one at the next link, which displays how every additional bushel and then some of corn grown in the U.S. for the past decade has gone to ethanol production. We're quite content to burn ethanol in our cars instead of feeding it to ourselves or our livestock--so far.

<http://www.marketminder.com/a/fisher-investments-inside-reasing-global-grain-prices/ab321c53-a493-4c7c-94e6-b2ffae6a484a.aspx>

On another note...

"One small example is the encouragement I've tried to give to the rediscovery of the slide rule as an effective calculating device. There are still plenty of people alive today who know how to use slide rules, plenty of books that teach how to crunch numbers with a slipstick, and plenty of slide rules around. A century down the line, when slide rules will almost certainly be much more economically viable than pocket calculators, those helpful conditions might not be in place—but if people take up slide rules now for much the same reasons that Erikson kept the tall ships sailing, and make an effort to pass skills and slipsticks on to another generation, no one will have to revive or reinvent a dead technology in order to have quick accurate calculations for practical tasks such as engineering, salvage, and renewable energy technology."

Steampunk calculators--how could I forget? I'll see if I can use that example in my class next week, too. If I do, I'll point out that you thought of the idea.

[Reply](#)



John Michael Greer 3/26/14, 6:58 PM

Ventriloquist, that makes you the 21st person to forward that to me. Yes, it's an interesting study, and I'll probably comment on it in a bit.

Pongo, that's very good to hear. Are you involved in that work at all?

Paul, it depends wholly on what's cheaper. Once the cost of human labor comes down below that of complex mechanical gadgets -- and in a world of 7 billion people, that's going to happen -- it'll be back to human hands and minds instead.

Raven, got it.

Kyoto, I've seen dirigibles discussed now and then in terms of cost savings, but helium's the big challenge at this point, as -- surprise! -- it's been used at an irresponsible rate and the world is running low on it.

Jose, that's an interesting point, which probably deserves a post of its own one of these days.

Glenn, I should have known that you'd have heard of Erikson. Your comments on the economics of auxiliary engines are spot on, of course.

Andrew, exactly. Even for an individual, there's only so far you can go before uneconomic activity starts making it hard to pay the rent, but green wizardry has its payoffs -- lower heating bills and a better diet, for example -- and you're right that there's more wiggle room where the market isn't directly involved.

Robert, got it.

Ruben, glad to hear the shanties are being kept alive! Have you considered finding some additional way to contribute to the revival of tall ships?

Joel, I'm delighted to hear it! I had similar feelings when I was turning the backyard here into garden beds -- and similar aches. ;-)

John John, indeed it is.

Onething, heh. I don't claim to know what's true, I just give it my best guess and see what happens.

[Reply](#)



jemand 3/26/14, 7:12 PM

I am reminded of the learning curve demonstrated from Thor Heyerdahl's three ships, from dismissing reports of reed boats and using logs, the many details relearned from that single voyage, though much of the actual trip was at the mercy of the currents.

To the second boat, out of reeds this time, finding it wasn't so impossible as one might think, again still reinventing most things, still mostly just going where the current went.

To the third boat, again of reeds, but this time, determined *which season* of reed, more details of the rigging and tiller and rudder, and this trip in the Indian Ocean more or less having fair control over where they were headed. Even surviving being straight up rammed by a metal boat with relatively minor damage (still managed to get around).

I can only imagine what reed boats and log rafts after several generations of incremental technologies might be capable of.

Of course these were technologies which more or less died thousands of years ago before the *last* dark age (or even the one before that) but still.... a few of these technologies might be worth reviving out of archaeological niches of curiosity, and back into actual every day use!

(Just a note on Thor Heyerdahl, his were some of the most paradigm changing books I ever read as a teen, gave me a respect for the intelligence and capacity of peoples of the past that is rare these days, and a feel for the pulse of technologies and stories and empires and past global voyages and cultural exchange which, though I was otherwise steeped in the cultural myth of progress, gave a good basis for an alternative to grow. Fascinating, wonderful books.)

[Reply](#)



Cherokee Organics 3/26/14, 7:18 PM

Hi JMG,

What an interesting and forward thinking gentleman. Shame his children treated him like an anachronism and sold off the fleet - probably for scrap too. Cheeky scamps.

He was spot on too about the [Roaring Forties](#) being a source of consistent and plentiful - free - energy!

If you look at the Clipper trade route on the Wikipedia page it is almost perfectly arranged for wind powered ships to travel from Western Europe to South Africa, Australia, New Zealand, South America and then back to Western Europe.

It is also a fascinating coincidence that once sailing ships copped it in the neck, so too did our agricultural export markets. People at the time blamed the "tyranny of distance", when it was possibly more accurately described as the "tyranny of oil". They forgot or ignored their recent history of massive agricultural exports.

Speaking of which, you mentioned a few weeks back that nature does sudden very well. Sudden, doesn't quite explain how the farm here has gone from feeling like an arid zone to the sub tropics. The tail of a cyclone on the north eastern coast dumped another inch here last night and this morning. With temperatures in the high 20C's and low 30C's over the next few days and humidity up around 99%, the place will turn into a jungle... Autumn here is usually another growth phase. I'm begining to suspect that this area has 6 distinct seasons per year and the lean time is actually January and February - which would seem unusual to people in the Northern hemisphere, but not down here.

This may be a good thing as I'm continuing to experiment with different crops and the coffee, babaco and avocado all seem to be happily growing along nicely. Plus I'm harvesting my first grapefruits too. My thinking is to do something unexpected if you want to create a niche market.

Speaking of the tyranny of oil, I'm always a bit uncomfortable when I see an image of a farm as it usually involves some bloke on a tractor. Just sayin... Those 8,000 tons of Australian grain were produced and transported without oil. It is worth thinking about. I understand that a lot of plant breeding went into those grain species and at the time we had very undemanding (of water and fertility) species which were abandoned when higher yielding (but fertiliser and water dependant) varieties were foisted upon farmers.

I spotted a tomato variety here that self-seeded this year and produced a month earlier than every other variety. It also sailed through summer. That's definitely what I call a keeper!

Financial products (an oxymoron if ever there was one) often come with a warning. Past performance is not indicative of future performance. Shame people fail to understand what that means in the real world in relation to oil.

Regards

Chris

[Reply](#)



Lance M. Foster 3/26/14, 7:27 PM

I have no doubt that smaller sailing craft will be part of the future.

However, tall ships? I am not real knowledgeable about them. Don't they require big trees, real old growth kinds of trees, for masts and such?

I recall hearing or reading that Britain ran out of timber for their tall ships, and then they began to harvest the trees in the northeastern U.S. and that saved their shipbuilding industry and war capacity. American trees are a part of why they won against France and dominated the seas.

Yet, most of our big and old trees are gone. It will take a long time for them to grow back. And the climate changes will surely affect tree growth as well.

Synthetics (plastics, etc.) for masts and such are dependent on abundant and cheap oil. So if synthetics are not used for masts for tall ships and big timber is scarce, what will take their place?

[Reply](#)

[Replies](#)



Dmitry Orlov 3/28/14, 2:55 AM

What replaced "grown" masts around the end of the Age of Sail were "built" masts made by joining together smaller timbers.

[Reply](#)



Cherokee Organics 3/26/14, 7:58 PM

Hi JMG,

Forgot to mention about the hazardous toxic environment that may be left for future generations.

If anyone is interested the link below has an update on fracking in Australia.

[Fractured country - An unconventional invasion](#)

Weird times. Water is life Down Under.

Regards

Chris

[Reply](#)**Bill Blondeau** 3/26/14, 8:07 PM

I worked on an ocean-going tug for a while, as deckhand and electrician, in the early 1980s. Our chief engineer was a Swedish man named Harry.

Harry had lied about his age to get the job ("They would not have hired me if I had told them how old I am. I said I was 67; I am 83 years of age.") Harry had started his nautical career as a cabin boy on a windjammer - likely, given the history you've just related, one of Captain Erikson's fleet.

If my granddaughter or grandson go to sea, it's plausible that they would go under sail. The historical period of the economic dominance of petroleum ships is possibly *that* short.

[Reply](#)**Enrique** 3/26/14, 8:31 PM

Wow! Someone else still remembers Captain Erikson. I'm impressed, but then again, you seem to be a veritable font of wisdom about history and a great many other things, including long-forgotten technologies. I remember reading his story, including his prediction of a new golden age of sail back when I was a little boy. My parents bought me the Time-Life "Seafarers" series back when I was around 9 or 10 years old and I read all of the books in that series, including the one on windjammers. My father was a naval officer, so it's in the blood. I was one of those nerdy kids who was reading "Janes Fighting Ships" and stories about pirates, aviators, explorers, submarines and naval battles when all the other kids were reading Dr Seuss or Judy Blume. I used to dream of what it would be like to be an officer or sailor on a windjammer, a sail frigate, a U-Boat, or some other ship from days gone by.

I also remember Oswald Spengler addressing the young men of his era in the "Decline of the West". One of the careers that he urged talented young men to consider was seamanship. Captain Erikson was right, just a little ahead of his time. It's a pity his heirs lacked his vision.

Incidentally, there is at least one windjammer in service as a cruise ship, the Royal Clipper, and several others as training ships, including the US Coast Guard training ship USCGS Eagle. The Royal Clipper was explicitly modeled after the famous windjammer Preussen, the biggest sailing ship ever built. There is also an effort in France to build a replica of the France II, which was another famous five master and the second largest windjammer after the Preussen, though the efforts don't seem to have gotten very far.

<http://www.starclippers.com/us-dom/our-fleet/royal-clipper.html>

<http://www.hnsa.org/ships/eagle.htm>

<http://www.grand-voilier.com/tallship/navigation/france.htm>

[Reply](#)



Grebulocities 3/26/14, 8:35 PM

@ Pinku-Sensei - When you discuss the $I = P \cdot A \cdot T$ equation, do you mention that A climbs faster than T falls, and P climbs, albeit at a decreasing rate, until the society has either reached a European level of wealth, or suffered a Soviet-style collapse? Do you mention that increases in affluence per capita result in far higher total CO2 emissions, especially as GDP per capita increases from \$1000 to \$10000 (the sort of transition we saw so rapidly in China, and also in a variety of other developing countries) even as carbon efficiency per dollar of GDP also improves? An economy growing at 5%/year and improving carbon efficiency at 2%/year will increase its emissions at 3%/year. And physical reality ultimately doesn't care about how rich we are in terms GDP per capita or per ton CO2. The important things to look at are total global emissions (increasing at about 2%/year) and the average EROEI for all energy sources (rapidly falling).

The article you posted is an excellent example of the sort of economic handwaving that tries to convince us that environmental damage, while a problem, isn't something we need to worry too much about. I'm not sure whether you're trying to defend it or just bring it up, but it is a stellar example of what passes for serious economic discourse on the environment.

I acquired Technology Will Save Us Syndrome (TWSUS) a while ago and it took me about five years to recover. It's nearly universal among economists and afflicts the majority of natural scientists as well, with the notable exceptions of ecologists, climatologists, and petroleum geologists. Some people never recover from TWSUS, but survivors develop antibodies that render them immune to it, at least for a long time. Reading that article brought back memories of when I was still a TWSUS patient.

[Reply](#)



nomadicista 3/26/14, 9:38 PM

It is with trepidation that I comment on a topic such as this, as what I have to say is likely to offend the sensibilities of many. Sail is a romantic notion after all.

As a bit of background, I am of the fourth generation, working in the maritime industries, which goes back to my Great-grandfather, who was an able-seaman of tall ships. His brother bought four tall ships around Cape Horn, as Captain.

The age of sail is greatly romanticized. To be blunt it was a brutal existence for those who worked it. it is also worth learning about the coffin ships as an extreme idea on this theme.

My take on the return to sail is thus. By the time it happens, only a small fraction of a percentage of cargo will cross the oceans, as what does today.

The first hurdle that needs to be addressed, is regaining the skills to operate a sail powered cargo ship.

Let me be very clear here: Those skills do not currently exist, and there is no one to teach them.

If you wish to know what I am talking about, look into the loss, with all hands of the tall ship Pamir.

On that fateful last journey, it was captained by an experienced training sail ship Captain. Unfortunately, his experience was not that of a cargo Captain, which led to some poor decision making, which proved fatal. This was before the complete end to commercial sail.

To give a bit of context to the problem of switching to sail, while maintaining cargo volume, I would point to the current example given by one of the above commenters. That ship carries a cargo of 35 ton. On a contemporary container ship, one single crane driver will load approximately 30 times that amount, per hour. A typical container ship would contain around 4,000 times the cargo capacity, depending on which ports are being serviced, than that one sailing ship.

Now consider the amount of cargo shipped across oceans, by air (well and truly less than ten percent) Think of the infrastructure required just to replace that amount. And you can be sure that airfreight will become uneconomic, well before ships with internal combustion engines.

[Reply](#)



Kutamun 3/26/14, 9:50 PM

Living on a large island , we Aussies , particularly those of us descended from convicts have always had a big fascination with sailing ships.

Granny Kutamun , in fact , came out on the first fleet , on "The Lady Penrhyn", though it seems there were not too many "Ladies" aboard

Good on you , Granny

(from Robert Hughes seminal work "The Fatal Shore " , taught to Aussie schoolkids)

"at first , the fleets track looks remarkably indirect : why cross the Atlantic twice to get to Australia . ? In fact , it looks like his course from Portsmouth to the Cape of Good Hope via the Canaries and Rio made the best of prevailing winds and currents ... At Cape Verde , adverse winds prevented the ships from anchoring , and now the weather became intolerably hot and humid ; as the fleet entered the tropics waves of vermin crept out of each vessels foul bilges , rats, bedbugs, lice ,cockroaches fleas . Even those whose guts have heaved at the whiff from the boats head at sea can have little idea of the stink of eighteenth century bilge- stink ; a fermenting , sloshing broth of sea water mixed with urine, puke dung , rotting food , dead rats and the hundred other Attars of the Great Age of Sail..

When tropical rainstorms whipped the fleet the convicts stayed below under battened hatches and conditions in their steaming, stinking holds were extreme "

"The marines aboard the four female transports ,Charlotte, Lady Penrhyn, Prince of Wales and Friendship could buy a woman with a pannikin of rum , then when the women got unruly they were ironed and sometimes flogged..

Surgeons Log Aboard "Charlotte" - the hatches could not be suffered to lay off during the night without a promiscuous intercourse immediately taking place between the women and the marines and seamen ..desire was so uncontrollable that neither shame nor fear of punishment could deter them from making their way "

Surgeons Log - Lady Penrhyn

" but i believe i may venture to say that there was never a more abandon'd set of wretches

collected in one place at any period than are to be met with in this ship ..the greater part of them are so totally abandon'd and callous'd to all sense of shame and common decency that it frequently becomes necessary to inflict corporal punishment upon them"

It was one of the great sea voyages in English history . Captain Arthur Phillip, a middle aged nonentity had brought them across more than 15 000 miles of ocean without losing a ship. The entire run had taken 252 days . A total of forty eight people had died (3% mortality) . The sea had spared them ... Now they must survive on an unknown land ."

[Reply](#)



Kevin 3/26/14, 9:54 PM

I've linked to this project here once before, but it seems worth calling to the general attention again, considering the content of this post:

<http://educationaltallship.org/>

I feel it bodes well that youth in particular are intended as the primary educational beneficiaries of this project. The idea is that it will teach them about the history of sailing & seamanship; I've detected no sign so far that anyone involved is considering the vessel under construction as a potential for-real cargo ship, or training ship for cargo sailors. It might be considered an example of "stealth conservation" - like carding wool or spinning yarn with the SCA: a charmingly romantic, impractical hobby, until in the fullness of time...

I've recently bought the plans for a boat. It's not a traditional design, but will be a small modern catamaran of plywood and fiberglass. Still, it'll be wind-driven only, unless I get a yuloh.

Solar power, wind power - according to Mr. Cattan, someone like me ought to do well with fire-powered things; but I'm not sure I want to build a rocket stove. No one can do everything.

[Reply](#)



Kevin 3/26/14, 9:59 PM

BTW, my maternal grandfather was a sea captain hailing from Norway. I have his old copy of Bowditch, 1948, and a book of Azimuths. Sure wish I had his sextant and ship's compass, both of which I distinctly remember.

[Reply](#)



Ruben 3/26/14, 10:09 PM

I forgot to mention, when my dear friend JB MacKinnon was researching his latest book, [The Once and Future World](#), he found quite a bit of history on how east coast fishers resisted mechanization and the shift away from sail. It seems they clearly understood the damage the loss of human scale would cause.

[Reply](#)**John Michael Greer** 3/26/14, 10:32 PM

Pinku-Sensei, one of the perquisites of empire is that a lot of arable land that doesn't officially belong to the imperial power might as well do so, and can be used to replace land that's diverted to imperial projects -- pyramids, ethanol, or what have you. It'll be interesting to see what happens as America's empire continues to wind down.

Jemand, agreed! I read his books, and also grew up with Erik Hesselberg's *Kon-Tiki and I*. It was a good way to start thinking about simple ways to do challenging things.

Cherokee, I'm fascinated to hear that Australia's agricultural exports didn't make the leap to diesel freighters. I'm left wondering: could it be that even now, the only economical way to get Australian wheat to European markets would be by sail? Glad to hear you've got plenty of rain.

Lance, for the next century or two, salvaged steel from skyscrapers will probably be the most common raw material for masts, spars, etc. After that, whatever maritime country has had the common sense to encourage the cultivation of suitable trees will have a massive economic advantage over their rivals.

Cherokee, sorry to hear that you've got the same fracking idiots down there...

Bill, he very possibly was -- a lot of young men went to see for the first time on an Erikson ship. As for your speculation -- well, yes, very likely it will be.

Enrique, I own a set of those very books. They were coming out when I was in high school; I read them then, enjoyed them greatly, and about four years ago had the chance to snap up a complete set for \$20 and jumped at it. It's one of three Time-Life series I have -- the Life Nature Books, Planet Earth, and The Seafarers -- which are, to me, the literary equivalent of comfort food.

Nomadicista, of course it was a harsh existence, and of course total world trade will be a small fraction of the present volume in a future age of sail. There will be a lot of harsh experiences and a lot of sharp restrictions in the future -- and I'd point out that even in the heyday of the age of sail, when most people had a clear idea of what was involved, a lot of young men voluntarily went to sea.

Kutamun, thanks for the bit of family history!

Kevin, keep your Bowditch safe. Generations of future seafarers may depend on copies made from it.

[Reply](#)**Sixbears** 3/26/14, 11:57 PM

My wife and I just spent 2.5 months sailing around FL on a 19 foot boat. At Marco Island we ran into

a large sailing boat, a converted Belgian river barge, loading up old sails for Haiti. The sails came from the Sails for Sustenance.

<http://sailsforsustenance.org/>

Then we have the Vermont Sail Project:

<http://vermontsailfreightproject.wordpress.com/>

They made it happen fairly quickly.

There are all kinds of working sailboats on the drawing boards. Few get built as the market isn't quite there for them yet. However, those who time it right will become wealthy.

[Reply](#)



steve pearson 3/27/14, 12:14 AM

Interesting timing. I am in the midst of reading a fascinating book called "Rounding The Horn" by Dallas Murphy. He combines the story of his charter sailing trip from Ushuaia to Cape Horn & back with the history of ships rounding the tip of S. America from Magellan, Drake, Cooke, Darwin to the windjammers. He only mentions Erickson in passing (his stinginess which was typical), but spends quite a bit of time on the story of a boy who shipped on the British Isles in 1905 where they took 71 days to round the horn with the loss of much life. They actually were carrying coal and had a coal auxiliary engine, but the captain didn't want to waste the owners coal, so they didn't use it.

With the Panama canal, one wouldn't need to round the horn westwards in a future age of sail. It could make sense eastwards, though they lost a lot of ships that way from broaching in big seas.

As long as there is any fossil fuel available, an auxiliary motor sure is nice for seeking a safe haven in a storm, crossing the doldrums, etc. That is the procedure now in the Philippines, Indonesia, a lot of third world countries.

Even when I was a kid in the 40s, 50s, 60s only certain luxury items were imported: French wine & perfume, English suits, Italian shoes, Asian spices and silk. The jeans and sneakers and fridges were made locally. The trade in unique luxury items goes back to antiquity (anyone for frankincense & myrrh). I would imagine a future world in decline would revert to that pattern. Sailing ships would be adequate for that trade.

I can see the trend starting with many present ships being rigged with down wind sails and progressing to ships being built as primary sailors with auxiliary engines, then on to sailing ships. I believe there is already an alternative movement in Holland, Germany or Denmark to try using small sailing ships for local runs.

Certainly not boring times. I wouldn't be dead for quids.

regards, Steve

[Reply](#)



peterpeasant 3/27/14, 1:20 AM

Sail as such is not the only alternative.

there have been successful experimental vessels utilising wind power via wind foils that ameliorate the necessity of petroleum.

The utilisation of wind, solar and electric sources for power are being explored very actively being.

I would not discount the return of some form of a "windjammer"

[Reply](#)



DesertedPictures 3/27/14, 1:28 AM

Reading your article I thought about another old technology that might make a comeback in the next century. I live in the Netherlands and they have a broad network of tramlines here in the city. They are obviously powered by electricity now. What most people don't realise however, is that the tram (streetcar) here precedes electricity. They used to be powered by actual horses. The network is much more expansive then it was back then of course, but the technology behind it is basically the same as in the 19th century. It can imagine the current company going down in a couple of decennia due to a 'never before seen crisis'. Another company might pick up the rails, sell the current trams to a country that still has oil and then restart the horsetram.

Another thought I had, living here, was regarding your posts about steampunk. They obscure the difference between countries, even when they are both oil-dependent. While the USA gave up bikes after World War 2, in some European countries they where embraced. The entire infrastructure developed along different lines because of that. You find direct bike-paths between cities and towns everywhere. They might be around long after the highways are abandoned.

And finally an interesting observation about American power these days. President Obama visited the Netherlands for s summit in The Hague. He got enormous coverage and everyone expects (and for the very near future are probably correct) more tourists for the musea he visited. There was incredible enthousiasm for the man. (Obamania is apparantly still a thing in the Netherlands)

At the same time the Chinese president payed the country a visit. He brought countracts worth 2,5 billion euros.

[Reply](#)



Tom Bannister 3/27/14, 2:08 AM

You're mention of windjammers having an emotional attachment reminded me of something. Many people, of course (as you have mentioned many times) do not adopt a piece of technology purely because of its commercial viability. They do so in part because of emotional attachments. Why do we have so many elaborate fuel inefficient cars around after all? (even in an age where the price of petrol is really starting to bite)

Just an example from here in New Zealand. One of the responses that is ALWAYS leveled at attempts to restore railway networks here is they are not 'commercially viable' (meanwhile hundreds of millions are spent on completely uneconomical roads... just a fraction of that money

would go a long way to restoring railways around NZ). A report for example about the closing down of a particular railway line, talked only of immediate short term commercial viability- with only a small reference to 'volatility in oil prices'. Keeping the railway line open would be a few million dollars, at most! (our government, whoever is in charge are sadly in the pockets of lobby groups who want more roads built. Whatever the cost).

What of course is almost completely ignored in discussions about transport is the emotional attachment people have to a particular mode of transport. Plenty of people talk about how comfortable rail is. Appeal to peoples emotional sentiment about travelling by rail and there may well be a winner! It wouldn't necessarily take a huge amount of cash after all.

Of course, this depends whether we are talking about fancy electric trains or steam trains or whatever. Though here in New Zealand we have a plentiful supply of renewable energy and coal/gas (allowing for the oil subsidy these energy sources receive).

Anyway, perhaps a little off topic. But as always thanks for a great post!

[Reply](#)



Jason Heppenstall 3/27/14, 2:10 AM

Captain Erikson was indeed ahead of his time. I'm sure he'd be glad to hear about the so-called 'Slow Cargo Movement' which is just starting to, er, set sail. There's a company down my way that is already delivering goods across oceans using a 1907 ketch. There's a diesel motor on board, but only for getting into and out of ports.

[Slow cargo ship sets sail](#)

If you're into your degrees of separation I can claim to have met the late British travel writer Eric Newby who, in 1938 (aged 18) wrote a letter to Gustav Erikson asking to be a crew member. To his surprise he was accepted and shortly set sail on what would turn out to be the last grain race to Australia. He sailed on the four-masted barque Moshulu, and later wrote a book about it (The Last Grain Race) which is well worth a read for anyone interested in all aspects of sea travel.

Incidentally, it was not all fun and games aboard these boats. His advice for anyone wishing to undertake such a voyage in the future (paraphrased) was: "The moment you step on board find the biggest, meaning looking crew member aboard and pick a fight with him. You might end up being beaten to a pulp but you'll save yourself months of bullying at sea if the other sailors don't think you're a pansy."

The Moshulu, it turns out, avoided being scrapped. These days it is a [theme restaurant](#) in Philadelphia ... maybe it's worth keeping an eye out in case one day the restaurant needs to suddenly liquidate its assets...

[Reply](#)

Karim 3/27/14, 2:37 AM



Greetings all!

Your knowledge of history never ceases to amaze me! The story of Erikson is as grand as it was unknown to me.

That sail transport is making some sort of come back is a given but to what extent remains to be seen.

But more than that, what is really important, at least to me, is that you bring out the crucial aspect of cost. It is amazing how people, by and large, have so little clue as to the impacts of costs.

Things get done and technologies spread out if and only if costs are met. Otherwise things get discarded and forgotten.

It is a simple, brutish law of existence that everybody should do well to remember. A bit like Darwin's mechanism of natural selection.

It is always good to point it out repeatedly as you do.

On a side note, years even decades ago, I dreamed about airships and I wondered whether one day they would come back again. I would not be surprised if they do so in the decades ahead to some extent.

I would not be surprised even if they were to use hydrogen as lifting gas - helium being rare and expensive - though it is an inflammable gas. After all jet fuel is very inflammable and yet we still use it.

[Reply](#)



[Les 3/27/14, 2:45 AM](#)

Hi JMG,

Loved this essay, thank you.

One possibly salient detail missing from your sailing vision is that of warehousing. One of the factors that kept Erikson, Villiers and their ilk going was the fact that, for some cargoes, a slow passage was an advantage. The ships also doubled as floating warehouses. If it took 120 or more days for a cargo of wheat to get from Port Lincoln to Portsmouth, then that was potentially a couple or three months that you didn't have to pay for warehouse storage of the crop (as it was only the first few shiploads that got top price for the cargo).

In most of these ports, the warehouses have long since been converted to condos, artists' garrets, restaurants and other sundry tourist traps; while the warehousing has been moved to the urban fringes. It'll be interesting to see what the cost may be of converting those condos back to warehouses. Sure it'll be way less than the current condo owners think it should be, but it'll

probably still be a pretty major factor of the economics of going back to sail.

Small additional detail: your quoted figure of 8,000 tons of cargo applies only to the very largest of the sailing ships (Preussen, et al), which were found by their owners and crews to be pretty much unworkable. The owners of Preussen, F. Laeisz, went back to smaller ships after that experiment. Two to three thousand tons of cargo was more typical of the successful ships.

@nomadicista: you clearly live nowhere near an historic seaport. The world is crawling with people dedicated to keeping the sailing traditions alive. I'm a farmer and I have met at least 200 people who are capable of sailing a square rigged cargo ship. Admittedly, in a previous life I used to be a bo's'n on a barquentine (more of a short ship than a tall ship, for sure) and probably taught 100 of them to hand, reef and steer; but there they are... Indeed, at the bicentennial celebrations on Sydney harbour, there were probably two or three thousand such people.

You may like to ask Dr. Google about "sail training ships" to get a better idea of what is going on in the world.

I'll concede your point regarding sail vs container cargo capacities. Do you really think that current capacities are sustainable?

@JMG: If there was an appropriate technology that could be nominated as "least likely to be thrown out with the bathwater", from my experience, square rigged sailing would have to be at the top of the list.

Final point: "modern" square rigs (those in use after 1860 or so) are wonderfully efficient compared to those that preceded them. Where in Nelson's time you might have needed 100+ sailors to run a largish ship (not including all the gunners, marines and the like), a ship like Peking could get away with 20 or less, if you took your time with manoeuvres.

Cheers,

Les

[Reply](#)



Richard Larson 3/27/14, 3:44 AM

One has to account for the scotch bottle hangover and loss of work!

I heard the word "whats the payback" so many times the last few home shows I am sick of it. I am equally sick of giving the same comeback answer, "What is the payback on Treasury Notes"? Bank CDs? What is the payback on your boat? Solar energy beats all those returns (ROI) and comes with an automatic escalator clause - as the price of energy goes up, so will your return. And your Bank CD won't provide you with heat or electricity either.

Then. THEN.

What is your return if the power goes out for a week?

[Reply](#)



Richard Larson 3/27/14, 3:46 AM

Oh. A solar steam engine on a windjammer is a ticklish good idea!

[Reply](#)



earthworm 3/27/14, 4:17 AM

JMG replied to nomadicista:

"Nomadicista, of course it was a harsh existence, and of course total world trade will be a small fraction of the present volume in a future age of sail. There will be a lot of harsh experiences and a lot of sharp restrictions in the future -- and I'd point out that even in the heyday of the age of sail, when most people had a clear idea of what was involved, a lot of young men voluntarily went to sea."

But the most interesting point that nomadicista made was:

"The first hurdle that needs to be addressed, is regaining the skills to operate a sail powered cargo ship.

Let me be very clear here: Those skills do not currently exist, and there is no one to teach them."

I think it is worth considering this in more detail rather than skipping over and focussing on the harshness of the existence and the fact that 'a lot of young men voluntarily went to sea.

It is 35 years since I was in the merchant navy when I studied as an apprentice navigator and my detailed knowledge is long gone; however, a few hazy thoughts come to mind as I sit here with a copy of 'The Efficient Deck Hand' and 'Elements of Nautical Astronomy'

On cargo handling

In the late 1970's I sailed on an 'old' general cargo vessel MV City of St. Albans (<http://www.clydesite.co.uk/clydebuilt/viewship.asp?id=11791>) <http://www.radioofficers.com/galleries/radio-rooms-ross-bradshaw-collection/attachment/city-of-st-albans-modified/>), and one of the things that all apprentices had to do was learn and qualify as a Deck Hand since as well as being responsible for the navigation of a vessel, the deck crew were also responsible for cargo handling.

This was at the time when containerisation was really starting to take off, but this old vessel still used derricks with powered winches - the use and maintenance of these things was quite extraordinary.

On sailing

In the late 70's we still used sextants when deep sea sea, but increasing reliance was being placed on electronic navigation aids. A gyroscopic compass is a thing of beauty and complexity and great use was made of the ships chronometers as well as astronomical tables and charts.

I am sitting here imagining a scenario on logistics and practicalities in relation to what nomadicista said about skills.

For ease, lets make the assumption that the skills to construct an ocean going cargo vessel are available and that the vessel is sitting there in dock waiting for its maiden voyage.

Let's also assume that the vessel has working steering gear and sails and that navigation equipment including charts, compasses, chronometers, sextants, log-lines etc

Cargo holds are ready and wooden derricks with blocks and rope tackle has been procured. It has not been possible to use steel cables so derricks are equipped with ropes and wooden blocks have been fitted and all that remains is for the winches to be installed.

Ship's stores including water, food, rope, timber, spare parts for repairs etc are ready to be loaded and the captain looks to the crew to begin the loading before loading a light cargo and doing a coastal run to make final checks.

Crew are undergoing final training in:

Seamanship including cargo handling, navigation, compasses, helm orders, steering gear, sail handling, maintenance and repair of sails, ropework, splicing, anchor windlass, use of derricks and winches, cargo stowage, bouyancy.... well you probably get the idea.

35 years ago some of these skills were becoming almost arcane - I have no idea how things stand today.

A deep sea vessel is like a miniature world and there are a lot of things to consider - to my mind nomadicista's implied questions are good ones and JMG, it might be worth asking yourself if you have fallen into a 'response-type' that you are usually pointing out to others?

[Reply](#)



Gunnar Rundgren 3/27/14, 4:26 AM

I have perhaps not too much to add, but t concur with the perspective of economics and practicability mostly being the main obstacle to technological ideas. That is very much the case in my field of work, agriculture. Again and again people come up with brilliant ideas, synthetic meat, vertical greenhouses. Sometimes the brilliant ideas are actually possible to realise, but in most cases they are simply not economically possible. That doesn't only apply to high tech, brown tech proposals, but also often to all those brilliant ideas of "feeding the world" with green or sustainable technologies. There are reasons for why arable, grain based crop farming has been the foundation for almost all bigger civilizations....

[Reply](#)



earthworm 3/27/14, 5:10 AM

Another issue (potentially significant beyond the subject under discussion here) is the behaviour of the magnetic pole in recent years.

Just two quick links from the top of a generic search:

Shift in Poles means Magnetic North Now East of Grid North for First time in 220 Years

Magnetic north has moved from west of Grid North to the east for the first time in 200 years, causing a massive reworking of the Ordnance Survey's maps...

http://www.huffingtonpost.co.uk/2014/01/20/magnetic-north-shift_n_4630742.html

Should walkers worry about magnetic north shifting?

Magnetic north has made an unusual and historic shift but how does that affect walkers in Scotland's hills?

<http://www.bbc.co.uk/news/uk-scotland-highlands-islands-25841106>

Well, I don't know about walkers, but if you are doing anything other than coastal runs, accounting for magnetic variation for ocean navigation is important.

[Reply](#)



Rhisiart Gwilym 3/27/14, 5:17 AM

Just a small note regarding saving ecotechnic skills:

Since I've began making rocket stoves of both L-for-Larry and J-for-lanto types, and several variations and combinations, one key thing that I've discovered by practical trial is that it's possible to heat moderate-sized pieces of steel to a good smith's working temperature, using nothing but wood - not pre-burned charcoal - and only modest amounts of wood at that.

This can also combine with space heating, heat-storing, and cooking. I haven't written any treatise on this, as yet, but I'm always willing to discuss it with anyone who wants to know more. Interested parties can reach me at Rhisiart@DDraigGoch.org

I take it that people here already know about Tres Hombres, but in case not, see here:

<http://svtreshombres.homestead.com/>

<http://svtreshombres.homestead.com/Eng/Ship/Contact.html>

I practical niche cargo tall ship already plying profitably between the Caribbean and Europe, though I imagine that a lot of the crew for the time being will be enthusiastic volunteers working just for food. As both the Archdruid and Dmitry Orlov point out, a lot of the successor/heirloom technologies waiting in the wings for near-term resuscitation, including practical sail-driven transport, are not quite economically viable at the moment. But wait a short while...

[Reply](#)



George Keller Hart 3/27/14, 5:25 AM

Great post.

You might like Eric Newby's book, The Last Grain Race, about this era and these ships.
<http://www.amazon.com/Last-Grain-Race-Eric-Newby/dp/0864427689>

[Reply](#)



Neo 3/27/14, 5:31 AM

What do you think about the revitalization of the Chinese junk ships? I think some of these ships can have cargo tonnages of up to 250 tonnes.

I think that there could be several obstacles before age of sail can be revived. First thing that comes into mind is the insurance of the ship. What is the present situation for those people insuring for leisure sailing.

Second thing that comes into mind is: will there be a explosion in the number of pirates? If we talk about Asia, the straits of Malacca and the area around Jolo and Ambon are pirate infested areas during the age of sail.

I am curious if the engine might be useful in certain cases to run away from pirates although i think the size of the large ships might mean the engine is no use against much smaller pirate ships with engines.

[Reply](#)



DaShui 3/27/14, 5:50 AM

I'm a little bit ahead of this post.

Not only do I have a hundred day old daughter, last month I bought a 16 foot sailboat for her to learn on. Looking at the rate of decline 20 years should b right for new age of sail.

My plan is at the age of 2 years, start teaching her knots, my teaching method will b something like "no dessert , until u can tie a bowline."

In school she can study geometry and trig. good for celestial navigation. Foreign languages, good for trade.

There is also the Sea Scouts, and Sea Cadets which the US navy's program to teach young people seamanship.

Finally we have some foam swords to spar with, hopefully the cutlass will also make a comeback .

[Reply](#)

jamesf 3/27/14, 5:53 AM



For a good read, I definitely recommend [The Last Grain Race](#) by Eric Newby, about the author's first and last voyage as a crew on the [Molushu](#) (and Erikson four masted steel barque) for it's final voyage from Australia to the UK in the grain trade.

The Molushu it seems is now a floating restaurant in Philadelphia.

[Reply](#)



[escapefromwisconsin](#) 3/27/14, 6:40 AM

Wasn't it another prophet of Peak Oil, Hyman Rickover, who moved the U.S. navy to nuclear power?

[Reply](#)



[Phil Harris](#) 3/27/14, 6:51 AM

JMG

I can imagine that using current modern resources and made from the right steel a windjammer hull might last 1000 years (minus accidents of course - every good thing comes to an end). Business plans like those, however, as your example points out, tend not to survive generations. But the Ol' Man's plan has to be better than footling 'paying concerns' like building the world's tallest buildings?

Grain from South Australia?

Chris @Cherokee made the good point last week that forestry removes a significant chunk of soil fertility: so does exported grain, (exporting wine or olive oil, much less of course). The route goes fertility to grain to city to watercourse to sea. That is OK provided you have a source of replacement soil fertility to spread on the ground - OECD moderns use mostly NPK of course. To replace soil fertility in the old days meant significant areas had to be kept fallow (not cropped), which was very slow, and meant a very small 'per-unit' surplus available for shipping. The cultivators had to eat. This method was replaced in temperate countries by increasing the most significant limiting factor - soil nitrogen - by rotating crops with clover/grass or alfalfa that have the bacteria to 'fix' nitrogen from the air. This was a much quicker renewal and produced a crop of meat, hide and wool at the same time - and Biofuel for horses! Which system reduced the number of cultivators needed for grain production - horses made more productive use of their share of the combination of grain and grass!

So economics worked until they didn't - and agriculture could not keep up with cities without another revolution. China could manage on its agriculture for a long time, because the urban population kept small compared with the rural hinterland. (Almost all of China's agriculture supported local productive populations and craft industries.) This was not true of the USA. Yields were drifting down along with soil fertility, especially in areas like the Great Plains. And there was no more 'frontier' to plow! But industrially synthetic Nitrogen fertiliser came to the rescue from 1920s onwards.

My guess is that climate will dictate where the Windjammers will find their high enough value bulk cargo. I guess they will not be fetching grain from South Australia. I am not at all sure either about refrigerated cargo from New Zealand, which provided significant food in my childhood (UK) from

NZ's high yielding grassland!

best
Phil H

[Reply](#)



Bill Pulliam 3/27/14, 7:11 AM

In spite of having settled in a landlocked state I still have a lot of seawater in my blood. So this article just makes me all warm and fuzzy. Being at sea under sail, you know you are at sea. You are not insulated from the ocean and atmosphere by a bunch of hard-driving machinery.

On a side note, quick item on the news I just heard: last year West Virginia recorded more deaths than births?

[Reply](#)



Pinku-Sensei 3/27/14, 7:16 AM

@GrebuloCities

"When you discuss the $I = P \cdot A \cdot T$ equation, do you mention that A climbs faster than T falls, and P climbs, albeit at a decreasing rate, until the society has either reached a European level of wealth, or suffered a Soviet-style collapse?"

Not directly in conjunction with the material, although I use both western Europe and the former USSR as example of what can go right and wrong. Europe works as an example of a less excessive use of resources for a comparable standard of living, while the collapse of the USSR, like the end of the Western Roman Empire, points out what happens to carrying capacity when the effects of government and other social organization to prop up K fail. As for the rest, I'll add that into the rant about how we're quite prepared to burn fossil fuels until we reach Jurassic levels of carbon dioxide, unless the resource we can use economically runs out.

As for 'the article I posted being an excellent example of the sort of economic handwaving to convince us that environmental damage can be solved by technology,' I mostly just plundered that article for its graphs, which made the point I want to get across. I'll have to re-read it carefully to examine the ideology behind it; in the mean-time, thank you for pointing it out. My response is that technology won't save us without changes in our behavior and thinking.

Finally, "Technology Will Save Us Syndrome (TWSUS)" is only a number of schools of thought about collapse. I have a graph from The Great Change Blog at the link that shows them all, along with a map of thinkers about collapse.

<http://crazyeddiethemotie.blogspot.com/2014/02/perspectives-maps-of-territory.html>

[Reply](#)

**Robo 3/27/14, 7:16 AM**

The life of a seaman in the age of sail was a hard one. At the age of 18, travel author Eric Newby applied personally to Gustav Erikson for a job on one of his ships. Newby subsequently shipped out on the 396 foot barque "Moshulu" in the fall of 1938, outbound to Australia for a cargo of wheat, returning to Britain in the spring of 1939. Newby's experiences eventually became the basis for his book "The Last Grain Race", published in the mid 1950's.

Even in the hard-bitten 1930's, Erikson was having trouble keeping his vessels crewed because the work was so unrelenting and dangerous. One voyage on "Moshulu" turned out to be enough for Newby.

Nowadays, with so many people living inside private electronic fantasylands, I imagine it would be even more difficult to encourage young people to embrace the harsh realities of life at sea. Not impossible, though, because deep inside our American culture there's always been a steady undercurrent of interest in traditional seamanship ... and now seawomanship too. This past fall I happened upon a tall ship named "Lynx" while she was docked at Clayton NY on the St. Lawrence River, enroute to the Caribbean for the winter. Half of the crew of about 15 were women.

Gustav Erikson's "Moshulu" is still afloat, currently serving (somewhat ironically) as an upscale restaurant at Penn's Landing in Philadelphia PA. Hopefully, when the need arises she will still be there to serve as a model for our future merchant ships, and the crewmembers of vessels like "Lynx" will know how to sail them.

[Reply](#)

**Brian Kaller 3/27/14, 7:25 AM**

JMG,

Thank you. I would only add that a return to sailing would transform almost every other aspect of life, in ways that are not necessarily obvious, no matter what other changes happen.

For example, most of us have grown up surrounded by cheap cargo transported from abroad; sailing ships would not transport as much as quickly or easily, forcing a reappearance of local factories and craftsmen. We are accustomed to stores having coffee from Sumatra, fruit from South America and meat from New Zealand, and a return to sailing ships would mean turning our yards back into gardens and our convenience chains back into dry-goods warehouses.

Sailing ships would require kilometres of rope, and perhaps a revival of the rope-making factories, up to half a kilometre long, that were once seen along coastlines here. Travel would not only be slower, but not necessarily in a straight line - ships between Europe and the Americas had to follow winds and currents in a circle. Sailors might have to carry lemons on board again, and women might once again be considered bad luck on ships.

Isolated islands and urban harbours might become vital again, and now-closed lighthouses might have to be rebuilt or reopened. Piracy, of course, has already made a comeback.

Some things have changed since the 19th century, of course - sailors once fed on fish through their voyages, but fishing is scarce these days, and a chaotic climate might deprive future sailors of predictable winds and weather. On the other hand, we know how vitamins and infections work, and we have canals through Panama and the Suez. It would be interesting to see how sailing ships could work with GPS and ham radio, however long those things can be sustained.

Having never seen the ocean until I was in my 30s, I am not the person to take up this particular endeavour. If some readers are serious about reviving them, however, might I suggest the Great Lakes as an incubator? Fishing tours and other upper-class pastimes might offer enough cash flow to sustain it for decades, or until the need for such skills is rediscovered.

[Reply](#)



Eddie Tennison 3/27/14, 7:38 AM

Thank you for the story about Captain Erickson, I had not heard of him. His story reminded me of a time when I was younger when my father, now deceased, assured me that interest rates would someday fall, something I refused to believe at the time.

I would love for sail to come back. It is perhaps the most appropriate technology man ever invented. As much as I love fossil fuel engines (and I still do, because I learned to as a boy, and people are slow to change)no form of transportation is really superior to sailing.

[Reply](#)



JC 3/27/14, 7:44 AM

Anyone interested to know what daily life was like on such a ship should read "The Last Grain Race" by Eric Newby. As a young man he decided on a whim to work on one of Erikson's ships on more or less its last voyage to Australia for grain. A superb read!

http://en.wikipedia.org/wiki/The_Last_Grain_Race

[Reply](#)



Maria 3/27/14, 7:49 AM

Hi JMG,

Like Pongo, I see first-hand from living on the coast that sailing is alive and well, with a whole industry surrounding boat building and maintenance. I've noticed -- not from direct association, of course, but from what one can overhear while one is catering cocktail parties and hosting big weddings -- that the same wealthy people who hire out their house cleaning and yard work often take pride in having the skills to refurbish and maintain their own boats.

Newport has a school dedicated to creating a workforce skilled in both old and new boat

technologies: [IYRS](#), and Rhode island is building a tall ship [The Oliver Hazard Perry](#). According to the Providence Journal, the OHP is the first oceangoing, full-rigged ship built in the US in 110 years. It will be (among other things) a floating classroom. So the skills are being kept alive right here.

[Reply](#)



John in Cape Charles Va 3/27/14, 8:15 AM

Hi JMG: I'd suggest that three outcomes of descent will drive the economics: 1. militarization of assets including oil, with state controlled rationing to economic stakeholders. 2. the rise of the black market for goods and services and 3. a rapid rise in piracy and mayhem on the transport routes. Thus economic costs of various supply chain models including sail will be trumped by simpler and more profound risks, aka staying alive.

Here in the Chesapeake Bay I think, god willing and greenland don't melt, we will have a very vibrant coastal trade, but fraught with the perils mentioned above.

[Reply](#)



Cathy McGuire 3/27/14, 8:17 AM

Fascinating - I hadn't heard of him at all, nor of the way that sails, steam and oil competed. I can certainly see the need for saving old tech, though - all along the roads I drive, old farm machines are rusting as decoration (seems a fad here ;-)) I just hope they don't sell them as scrap, because at least all the measurements will be readily available! And the Small Farmer's Journal has an annual horse-drawn farm tool auction (coming up soon in Madras, OR - wish I could go! <http://smallfarmersjournal.com/>), so some of these machines are already being reclaimed, thankfully.

But on the other side, i swear the younger generation is getting farther and farther away from nature (ie: reality) - last week my friend's daughter, a U of Oregon college student, proudly said she'd been taught to cook a potato for the first time (no, my friend doesn't cook...sigh...) - but then went on to say, "But then I found out it makes babies on its skin - and that was too yucky! So I threw them away." Arrgh - sprouting potatoes cause revulsion... then starvation unless that attitude can be reversed! :-(Frightening, really.

But thanks for the post! Today I'm hoping to get another rabbit hutch started, and then finish preps for the bee colonies I'm getting. Green wizardry is never-ending, but so much more rewarding than other work!

[Reply](#)



Unknown 3/27/14, 8:18 AM

As one of those maritime historians living in Maine carrying on the cottage industry (good one, Pongo!) I read this post with more than usual interest. One of my pet peeves is the usual narrative of how, once the steam engine came along, it was "all over" for sail. In fact, as JMG points out, they

coexisted quite nicely for over a century. Granted, the owners of the bigger sailing vessels adopted steam "donkey engines" to help with heavy tasks such as heaving up the anchor. Indeed, it was these very devices that made large sailing vessels possible; they became specialized ocean carriers with no cargo space (ie profit potential) taken up by engines or fuel. Many smaller vessels simply did without engines, and still do in places like Haiti (though Youtube videos show how a few outboards have made it aboard Haitian cargo sailing vessels).

As far as good reads go, check out any of Alan Villiers works, or Eric Newby's "The Last Grain Race". The latter takes place on Moshulu, a huge 4 masted bark sailing from Europe to Australia and back in the 1930s. Moshulu lies in Philadelphia now, a restaurant. Perhaps she and many other museum ships, waits for another chance to sail profitably again?

Also, check out these guys in Vermont:

<http://www.vermontsailfreightproject.com/>

[Reply](#)



J Dub 3/27/14, 8:19 AM

Thanks for the weekly column, JMG. It's one of my regular stops. I hear the warning, and I'm ready to make a change... but I'm comfortable in my gas-powered life, complete with a pension. I have some ideas, but it's hard to make the models match up to today's requirements, especially without start-up capital. I keep waiting for something to push me in the right direction, but things keep winding slowly down, with no signs pointing to the exit. The world needs pioneers. Here's hoping I find the courage to take the plunge.

[Reply](#)



Glenn 3/27/14, 8:32 AM

John Michael Greer said...

"Kevin, keep your Bowditch safe. Generations of future seafarers may depend on copies made from it."

Don't worry too much. A lot of copies came on the used book market cheap when GPS became popular. I've got 3 or 4 myself, ranging from 1938 to 1984. I also wish for a good sextant (got a cheap plastic one), but my neighbors have three nice old brass ones. What would be really useful is mechanical chronometers such as the famous "Waltham Watch".

As for skills? I can't throw a rock here without hitting a schooner captain. If I throw it 10 times I might hit the crew of a square rigged brig (Lady Washington). No shortage of sailing or shipbuilding skills on the Salish Sea.

Glenn

in the Bramblepatch

Marrowstone Island
Salish Sea
Cascadia

P.S. Captcha is navalle law...

[Reply](#)



Optouter 3/27/14, 8:34 AM

Excellent article Mr. Greer. This is a topic I have tried to follow for a couple of decades. Know that some high tech computer monitored sail configurations have been envisioned for retrofit to conventional merchant vessels. Also, large "kite" sails similar to a spinnaker but aloft on a single cable downwind of the ship.

On a different note, I must point out that auxiliary power of some sort is going to be a requirement on almost any vessel that enters a major port. As a volunteer for the Schooner Sultana project we had to install Diesel propulsion for safety reasons and that requirement is almost certainly going to prevail. Most of the sailing vessels that foundered throughout history did so because of a lee shore or the inability to steer the ship into heavy weather.

One further reality, I cannot imagine a solar powered engine on a sailing vessel large enough to overcome the friction alone of the propulsion system much less power the ship through the water.

A sailor and enthusiast of wind power commercial vessels.

Jack Davis

Sarasota, Florida

[Reply](#)



Pantagruel7 3/27/14, 8:46 AM

Pinku-Sensei: are you referring to the "Kuznets Curve?" I've always seen that as an error of scale - a small ripple on the surface of a large wave moving in the opposite direction. Now if you were Pinku-Roshi, maybe I'd have to take you more seriously. Generally, it's nice to see all the sailors emerging from the woodwork in response to this post. I was one myself. Sea transport seems to be among the low-hanging fruit of changes we should make along with the national energy grid, how we move around on land, how we produce our food and what we eat.

[Reply](#)



james albinson 3/27/14, 9:03 AM

Have a look at Eric Newby, "The Last Grain Race", see wikipedia for references and ISBN. He signed on Moshulu, a 4-mast barque, for the 1938-39 UK-Australia-UK grain run. The details of the hard life are well illustrated!

Everything metal at sea has a finite life due to corrosion and metal fatigue. I am not sure that even Ericson could have kept the hulls going for a century. Modern ships seem to be scrapped after 30-40 years hard use. Preserving a few old ships is a really expensive proposition.

Even with a heap of scrap steel, it still needs to be remelted and rolled into big sheets for hulls, and rolled into tubes for masts. In the absence of good quality coke for a blast furnace,

hydroelectric powered hearths seem to be the obvious route to take. Hence Scotland, NW USA, Norway et al may yet be the shipyards of the future.

[Reply](#)



Joseph Nemeth 3/27/14, 9:16 AM

@JMG -- Thank you for this post. It has clarified one of the root issues I've had about this entire project, and that is the urgency you place on "doing something now," as though doing something now will make a difference.

I still don't get this. Perhaps I just disagree with it.

We are going to have a population decline. You seem convinced of that, and I am convinced of that. I don't find your numbers or arguments unreasonable. So let's accept 95% global attrition over a long period of time, say 3-5 centuries.

This means a drastic reduction in "on-line" knowledge, meaning knowledge that is at a society's fingertips because someone has learned it, rather than simply having learned about it. Slide rules are a case in point: it's one thing to know about slide rules, it is another to know how to use one. In-depth knowledge of ancient Roman history is another. Retention of on-line knowledge is as subject to economics as anything else. If the population drops, there is going to be a vast "shake-out" of knowledge that will be triaged out of (on-line) existence, simply because there aren't enough heads to hold it.

So "doing something" in terms of preserving knowledge is a matter of trying to guess which 5% of our current knowledge is worth keeping on-line, without the benefit of experiencing feedback from the real (future) economic conditions that will drive what is actually going to be retained. It will be much less than 5%, anyway, because it's also likely that much of what will be valuable tomorrow is economically useless today and has (like the knowledge of managing a fleet of windjammers) already been lost, or has not yet been invented.

It's a fun guessing-game, but I don't understand the urgency, particularly when "doing something" runs counter to *current* economic conditions that put food on the table.

Erikson is a case-in-point: he made an attempt at securing future prosperity based on long-term predictions, and he failed: oil did not peak nearly soon enough. Had his children tried to preserve the fleet, it would have ruined any prosperity they had retained. As @jemand points out, it doesn't really take that long to re-develop any truly useful technology, so when windjammers become economically viable, they will be re-invented.

You've argued broadly that there is a window of opportunity for using current EROI prosperity to springboard into a lower EROI future, making the process less painful. I can see the argument, but I'd call it trying to plan for a poverty-stricken future while living in the lap of luxury, and people just don't do that, even when it comes to the all-but guaranteed personal matter of transitioning to an indefinitely prolonged retirement on a fixed income in an inflating economy. Wind and PV are being developed to service The Grid, so that we can begin to power electric cars. It's dumb, but so is stock trading, or working on ITER. It's how you make a living today.

[Reply](#)



Pongo 3/27/14, 9:24 AM

I'm happy to say I have been involved in those efforts, not as much as I would like (as I live in California now) but I have been able to lend my time and skills to a couple of projects from afar.

This is the fellow that I was talking about, the wooden boat builder who is going to be the subject of an upcoming documentary. His name is Ralph Stanley and I had the pleasure of watching him work on several occasions:

<http://arts.gov/honors/heritage/fellows/ralph-w-stanley>

[Reply](#)



Friar Puck 3/27/14, 9:43 AM

I've been thinking about this song for the past couple of days, but after reading this post, it seems appropriate on more than one level.

<http://www.youtube.com/watch?v=kKyTpOiTXI0>

I imagine Beli's shining spear igniting the masts, while Sul smiles steamily from the river that empties into the sea...

[Reply](#)



Ceworthe 3/27/14, 10:21 AM

We better be planting trees for is and when we need them to build ships and other things, if the steel runs out or the tech to deal with it all is lost. Good idea to plant trees in any case, including nut and fruit trees

[Reply](#)



John Michael Greer 3/27/14, 10:32 AM

Ruben, thanks for the reference!

Sixbears, that's good news.

Steve, no question, rounding the Horn was a bear. As for less international trade, well, of course -- that's baked into the cake no matter what happens.

Peter, true, but sail's a proven technology that had the bugs worked out a long time ago. The various nouveau windjammer tech schemes don't have that advantage.

Deserted, oddly enough, I'll be talking about tramlines and streetcars in an upcoming post. As for the differences between countries, well, as I keep on saying, there's a reason why I write about the US and not the whole world -- this is the only country I've lived in, and so my take on things will inevitably be shaped by local conditions.

Tom, that's an excellent point, and the emotional attachment people have to older alternatives might be a workable place in which to insert a lever to drive change.

Jason, living before the mast was harsh, no argument there. You win the "who's going be the first to recommend the book everyone else recommends" contest, by the way. ;-)

Karim, if hydrogen dirigibles can be made safe enough, it's certainly an option -- unlike helium, hydrogen isn't exactly in short supply.

Les, well, I did say "up to 8,000 tons." As for the number of people who know how to sail tall ships, that's very good to hear.

Richard, exactly. The fixation on short term payback, with zero attention paid to the other advantages of green wizardry, is just another set of excuses.

Earthworm, your question has been answered by Les and Glenn -- there are apparently a great many people with the necessary skills out there. As for the magnetic pole, it's not at all hard to take a sighting on Polaris on a clear night, and use that to correct for current magnetic deviation, you know.

Gunnar, thank you for a solid dose of reality! As I've been trying to point out for quite a while now, technical feasibility does not equal economic viability, and it's the latter, not the former, that matters in the long run.

[Reply](#)



divelly 3/27/14, 10:34 AM

I wonder if you're familiar with the life of the actor Sterling Hayden?
He was the last captain of a coastal sailing commercial cargo ship in New England at the age of 20 in the early '30s.
He was discovered by Hollywood, which he despised.
In the '50s, he built by hand a wooden sailboat, and absconded with his kids from his ex wife on a trip to the South Pacific with the kids as crew.

[Reply](#)



Ruben 3/27/14, 10:42 AM

Another excellent book--set a little earlier--is Dana's Two Years Before the Mast.

[Reply](#)



John Michael Greer 3/27/14, 10:48 AM

Rhisiart, that's fascinating -- though not surprising. It would be worth doing some experiments to calculate how much less wood a blacksmith would use by burning it directly in a rocket stove, rather than having it processed into charcoal and burning it in a conventional forge.

George, you're #2, so you get the silver medal. ;-)

Neo, I don't know enough about junks to be sure, but my guess is that they're very likely to be revived for oceanic trade. As for pirates, well, of course -- we've got 'em now, you know, and piracy is a standard problem during the declines of empires. Two hundred years from now the Chinese navy will doubtless be conducting campaigns to keep the Straits of Malacca clear of pirates, so that trade fleets can make the voyage safely from India to China and back.

DaShui, congratulations on the new member of the family! Definitely teach her how to use a cutlass -- do a little snooping around in online archives of old books, and you can quite readily find old naval manuals that detail the cutlass drill that was standard in the age of sail. Martial arts are worth studying for all kinds of reasons, and I see no reason to neglect the old Western martial arts.

Jamesf, you're #3, so the bronze medal is yours.

Escape, indeed it was.

Phil, it's an interesting question. My guess is that maritime freight in the deindustrial age will be limited to high-end agricultural products such as coffee and tea, manufactured goods from whatever countries keep some degree of factory technology going, and other goods with a high value-to-bulk ratio.

Bill, I hadn't heard that. Thanks for the heads up -- if that's starting to happen in one of the poorest states, we're closer to rapid population contraction than I thought.

Robo, you're #4 to suggest Newby's book, so you get an honorable mention. Good to hear about the *Lynx* and her crew.

Brian, all good points. One wild card, though, that needs to be factored into the picture is rising sea levels; as we get closer [to serious deglaciation](#), we're facing a future in which permanent maritime port facilities won't be economic to build for some centuries, since what you build this year will be under water within a few decades. I'll be discussing that in a future post.

Eddie, I'll put in a word for train travel, and I understand airships were also remarkably pleasant. Still, sail travel has very real charms.

[Reply](#)



earthworm 3/27/14, 11:00 AM

JMG said:

"Earthworm, your question has been answered by Les and Glenn -- there are apparently a great many people with the necessary skills out there."

That is interesting to hear about people capable of sailing square rigged cargo ships - I wonder how many are actually used for that purpose. Cargo handling is a skill in itself.

It would be interesting to know how much the sailing enthusiasts rely on modern tech resources (e.g. canvas, rope, rigging tackle etc).

JMG:

"As for the magnetic pole, it's not at all hard to take a sighting on Polaris on a clear night, and use that to correct for current magnetic deviation, you know"

We always used deviation tables.
;-)

Ah yes, and the 'simplicity' of taking star sights - we were taught how to do it, but relying on the sky for either sun or star sights was never a sure thing.

Still, it would be interesting to see how winches would be powered for cargo handling, and whilst I appreciate that a lot of people might have sailing skills, if anyone has more information on traditional sail ships carrying cargo via ocean passage, it would be great to hear about it.

I am too long out of the industry and have not kept up, but I would not be as quick to dismiss nomadicista's thoughts on the strength of limited anecdotal evidence (no matter how good) posted to the comments.

The sea is a harsh mistress and mistakes can be terminally costly.

[Reply](#)



John Michael Greer 3/27/14, 11:05 AM

JC, you're #5, so an honorable mention to you too. ;-)

Maria, that's really good news -- as fuel rises in price, the shipyard that's building the *Oliver Hazard Perry* may well find itself gainfully employed building the first of the next generation of windjammers.

John, those are factors, but they aren't the only factors. Trying to stay alive is rarely a full-time occupation for everyone, even in a dark age -- and yes, there was substantial maritime trade in the last round of dark ages, a detail I'll be discussing down the road a bit.

Cathy, that sort of blindness to reality can be cured readily. All it takes is a sufficient level of hunger.

Unknown, you're #6 -- here's your honorable mention, with a special award for mentioning Villiers.

J Dub, ahem. "There is no try; there is do, or not do." Sitting on the couch waiting for someone to

hand you the courage to do what you know you need to do doesn't make a useful contribution, you know.

Glenn, I'm delighted to hear it. I've seen far too many examples of valuable books hauled out with the trash. As for the Captcha, that's eerie...

Optouter, I'll leave the question of the viability of solar steam engines to those with the engineering background to consult Mouchot's plans and figure out how much power could be generated that way. As for auxiliary engines, for the time being, certainly; remember that I'm also trying to pay attention to the situation up to several centuries in the future.

James, and an honorable mention for #7! I'd put Iceland on the list, too -- all that geothermal steam could make it a major industrial center.

Joseph, yes, I know, you don't get it. I'm really not interested in rehashing these same points over and over again; if you don't think what I'm trying to do is useful, then by all means do something else instead.

Pongo, excellent. As long as you're either doing it yourself or helping those who are, I have no complaints.

Puck, thank you!

Ceworthe, no question, maritime power in the deindustrial future will depend, among other things, on which country has been most assiduous in planting trees for shipbuilding.

Dively, no, I wasn't!

Ruben, you get today's gold star -- partly for citing a book that has quite a bit to say to the issue that nobody else thought of bringing in, and partly because Dana's memoir is a classic of American literature, and deserves much more attention than it gets these days.

[Reply](#)



John Michael Greer 3/27/14, 11:06 AM

Earthworm, I'd encourage you to ask the sailors who've posted here, and who know a great deal more about the hands-on details of sailing than I do.

[Reply](#)



SLClaire 3/27/14, 11:14 AM

The low-tech equipment and knowledge I'm trying to save revolves around garden and landscape care. Not that I minded reading about sailing ships one bit, because the major point of your article - that it's economics that will doom most high tech stuff, and in the not too far distant future - applies to garden and landscape care, as you know and have mentioned in other posts. This year I have bought and will learn how to use yet another human-powered tool, a scythe. This to mow a

property that is an acre and still has a significant fraction in grass and weeds to mow. Everyone else on the street uses a riding lawnmower to mow their similar-sized properties. I've already caused stares from passersby who have watched me using a human-powered reel mower to mow the grass (a good technology too but it doesn't mow wiry weeds or zoysia well and I have plenty of both). Can't wait till people see me using a scythe ;-). The more serious purpose is to demonstrate their use in a non-confrontational way so people know they have other options when the time comes that they cannot afford to run and/or repair their riding lawnmowers. Meanwhile I will be mowing on breakfast as fuel, using my own labor and getting a workout, plus I can enjoy watching and listening to the goings-on of the other lives in the yard.

[Reply](#)



Ruben 3/27/14, 11:30 AM

Hat tip to whomever posted [Seasteading](#). It is really good, and very relevant to TAR.

At least I think it was someone here--I can't find the link in the comments in my quick skim...

[Reply](#)



Ray Wharton 3/27/14, 11:35 AM

I have chosen a path of little money, so as I train up to build these things I have to do so with the fact that I cannot afford any especially safe place to keep any catabolic-punk lab on my own budget. Recent memory is deeply etched with several hectic moves where even very good things became a serious liability. Once filling up the F-150 costs \$200 instead of \$100 that will be more serious.

This summer I am going to try making some "windjammers" appropriate to my ecosystem. With no oceans they won't move, they just have to compress air. I think I can finally afford the parts. Without a place that is really my own I am trying to strengthening I-Thou bonds with folks who had successful businesses during FoCo's boom times, and have the shop space, tools, and scrap mostly just sitting around. So much comes down to the I-Thou, but its a trick path, particular projects get delayed for reasons all too human. So I keep too many irons in the fire, trusting that some will be dropped. Its like pest control with organic meathods 'plant enough for the pests too.

In response to your question last week, the house is not nearly as well insulated as I would like, and much better sealed than it should be. Too much heat loss to conduction vs. convection. Humidity issues came up in a big way from trying to keep the house cool last winter. I hope that insulating the crawl space will help, and a few of the windows need more work, especially one in the basement. I probably only have one more winter here, but I plan to be ready for it. The biggest improvement I want is a south aspect green house to catch these powerful Colorado solar rays, but when my friends and I built the frame for it last fall we upset the ascetic tastes of my landlord's Mother. Ugh, its the petty stuff that really greases the wheels of decline, one little spat at a time. I will try to make a more modernish next time. The County Conservation Corp will be by soon to recommend more improvements. Sadly this is a 90's house in Fort Collins, its like living in a movie set that represents a house. Only one more year here I think.

p.s. I got to see Paul Stammets in Denver on Monday. Great speech, there is a guy who has set up one of those subsudies salvage operations I was theorizing about! Lots of his companies money comes from middle class people trying to buy immortality with fancy medicinal mushrooms (which are good, but not as a cure for mortality). That money then goes into some very impressive research on mycology. I hope to have my mushroom lab working good enough soon I can comment on how well it really works.

[Reply](#)



Jael Edgerton 3/27/14, 11:36 AM

Another "technology" nearly lost to the industrial world and generally poo-pooed even in today's green world is draft animal power, and horsepower specifically. I know that most of you have had little exposure to draft animals and mostly consider horses dirty, difficult to feed, and dangerous, and while you wouldn't be wrong in all cases, I challenge you to farm more than a few acres without fossil fuels OR a good draft team. I promise you this: you won't like it, or do it very well. As far as the oft-mentioned problem of manure disposal is concerned, it always seemed to me that only folks with a modern urban/suburban sensibility could really see manure as anything but the gift of fertility it really is. As an organic grower, I can't possibly get enough of the stuff. Regarding the expense of feed, much of the problem is a result of impractical modern breeding focused on horses as luxuries in age of abundance, with the sacrifice of thriftiness to other traits such as speed or extravagant movement all too common. I think many of you would be shocked how little it takes to feed one of the older, cold blooded work types (less than \$300 for my Haflinger last year), which was beyond worth when you consider that he easily replaces a tractor and a car, and generates a constant supply of organic fertilizer. And are horses dangerous? Certainly they can be with improper handling, as can any combustion engine, or bicycle for that matter. I urge all of you to look past your prejudices and remember working animals as part of a partnership that has served our species well for millennia, and one that we ought to consider reprising.

[Reply](#)



Jason Heppenstall 3/27/14, 11:51 AM

JMG: You win the "who's going to be the first to recommend the book everyone else recommends" contest.

I'm sure Eric Newby would be delighted to know that people are still reading his books. He came across as a very modest who had some truly extraordinary adventures. Not many people escaped from an Italian prisoner of war camp and lived rough in the Apennines with little more than a copy of 'The Decline and Fall of the Roman Empire' to sustain them.

Apologies for another anecdote, but as a journalist I was invited aboard a replica of the ship [Amerigo Vespucci](#) - a fully-rigged 18th century replica tall ship that was moored in Copenhagen. Sipping brandy with the captain in his oak-panelled dining room, he explained to me how the Italian navy uses ships like these to train their best sea cadets in the art of seafare. It was his firm opinion that modern warships would not be around forever and that ships like the Amerigo Vespucci would keep alive some of the skills needed for an age without much petroleum fuel.

This took place a couple of years before I learned all about peak oil, and I suppose it was a bit of an eye opener. I've since learned that several navies use these old tall ships for training purposes. Seems sensible to me.

On a related note, your post today inspired me to do something I have been meaning to do for a long time. Yes, I put my name down to volunteer as crew at the local sailing club. After all, what's the point of living in an historic port if you can't sail a boat? I hope to make a salty sea dog of myself yet.

[Reply](#)



Jan Wareus 3/27/14, 11:55 AM

Summertime, I lived with the family just a few nautical miles from Åland. Of course we loved the windjammers and built models of them. But we never understood the future would change - it was just romantic dreams.

But now, JMG, steampunk is back in China! As we here in Botswana are keen to sell our deposits of low grade coal via a new, billion dollars railway to the Namibian coast, steampunk would be good here, too. In China, they use steam locos, burning coal to transport, yes, coal thousands of miles to customers. It's on Google: www.economist.com/blogs/analects/2013/11/locomotives.

Hope we can have them instead of expensive diesel or electr locos. By the way, we are exporting, hopefully to China! Ironical it is!

[Reply](#)



steve pearson 3/27/14, 12:01 PM

There is a traditional double hulled Hawaiian sailing canoe, the Hokuleia, which is about to embark on a round the world trip using only celestial navigation. It is built with traditional methods. They have already done a trip to Tahiti and back. There is a comparable N.Z. boat. The crews have spent years studying and practicing the necessary skills. This is also tied in with a revival of interest in traditional Hawaiian language and culture. The movement in N.Z. seems similar. One could find out more through the Polynesian Voyaging Society.

As to whether this or any other skill will last through the decline, does it matter? If a journey is worth taking, has heart, one takes it. One can never know exactly how the future will play out.

Regards, Steve

[Reply](#)



daelach 3/27/14, 12:49 PM

@ JMG: Risking to state the obvious, the LESS principle will solve a great deal of the transportation problem by itself. Today, we are transporting much more cargo around the world than 200 years ago, and the simple reason is that a lot of transportation is economically viable when dirt cheap oil

is available, but it wasn't and it will not be viable when relying on sail ships. The globalisation will go out of the window together with the cheap oil that gave birth to it, taking its then superfluous transportation needs with it.

@ Optouter: the main reason why engines are mandatory today is that they are economically viable, so it isn't a great obstacle for ships' owners to overcome.

Let the economic viability change, and so will the mandatory requirements. The most obvious way would be to require ships without motor to be towed in by motorised tug boats.

[Reply](#)



RPC 3/27/14, 1:15 PM

@Jason Heppenstall,

Oh my goodness! Is that by any chance the same *Moshulu* that's currently docked in Philadelphia acting as an exotic restaurant/night club? Small world indeed...

[Reply](#)



Joseph Nemeth 3/27/14, 1:27 PM

@JMG -- Actually, I think what *you* are doing -- writing -- is extremely important, which is why I'm a regular reader, and will doubtless continue to be.

But I think you are right, and your advice is well-taken. My objection is a matter of real dissensus, and I need to find my own approach. I'll let you know if I come up with anything halfway reasonable.

[Reply](#)



KIEF 3/27/14, 1:34 PM

interesting post as always and interesting comments to learn from. Fits nicely with the book I currently read - Cathedral, Forge and Waterwheel - Technology and inventions of the middle ages by Frances & Joseph Gies. It covers to some extent the inventions in shipbuilding & navigations - mostly copied from the Chinese - and makes one aware how long the road was we had to travel to arrive at Captain Erikson's tall ship era. A personal aha or jaw dropping moment was when I read that the sails being made of linen (or silk!!) - I've been involved in a local "flax to linen" project here (http://flaxtolinenvictoriabc.blogspot.ca/p/blog-page_5.html) and have now a very good sense what it takes to make a square foot of linen. Wowzers! Making a sail would be very difficult given that productive lands need to be taken out of food production (although marginal lands can be used eventually), and are often not used for food production a while afterwards. Not sure how cotton production will fair in a post petroleum world, given the incredible amount of chemical fertilizers & pesticide used in todays cotton industry. My guess is that a lot of sails will be patchworks of salvaged fabric until the economics of sailing will allow for dedicated "fabric farming". Not so sure if I would hold my breath for steel ships, they only seem to survive with

expensive regular painting jobs (as do wooden boats). Maybe someone here with more knowledge of boats knows better what are they viable options for boat preservatives in the future.

[Reply](#)



Jonathan Hutchinson 3/27/14, 2:04 PM

Aloha JMG

I'm a longtime reader of your blog, first time posting a comment.

The age of sail is still alive. Ill be crewing a 80 foot schooner with solar PV equipment as cargo to palmyra atoll next month. For any that dont know, Palmyra is owned jointly by The Nature Conservancy and US fish and wildlife, and used as a research station for (among other things) studies on global warming and its impacts on sea life. For years the station has been powered by diesel generators, at huge costs. In the near future, it will be converting to Solar PV, and I'm proud to be part of the transition.

The cost of hiring a diesel powered cargo ship is substantially higher when the cargo is only 20 tons of equipment and supplies. Today's niche for sailing cargo ships is for small loads that would occupy only a fraction of the tonnage a larger ship could carry.

I'd imagine that future ships will be designed with sails plus PV panels, wind generators, hefty battery banks and small diesel generators powering an electric drive train. A concentrated solar steam engine is of no use in a storm, which is exactly when auxiliary power is most needed - not as a matter of economy, but one of safety.

The vessel I will be crewing has a large diesel engine, 2 diesel generators, a well equipped machine shop with welders, compressors, all the tools to repair the boat while underway, and 3000 gallons of fuel. In strong winds she can make 9 knots under sail alone, just as fast as under power in calm seas. But when that storm starts to roll in, I can guarantee the engine will be fired up and we will burn as much diesel as it takes to keep us (and the cargo!) safe. I imagine the cost per gallon could triple or quadruple before any sane captain would even think to forgo the auxiliary diesel aboard a sailing vessel.

I'm a life-long sailor, and consider myself competent on sailboats, but im far from the level of skill it would take to handle a 400' windjammer loaded with cargo in a storm. I'd imagine there are very few people alive today who would be comfortable in that situation. It would be quite exciting, to say the least.

[Reply](#)



Luckymortal 3/27/14, 2:40 PM

Cherokee, on the sort of environmental circumstances the future-kid must face, I agree. For me it was this news today:

<http://www.livescience.com/44318-chernobyl-trees-barely-decomposed.html>

Trees around Chernobyl won't decompose.

This is soil that has been dead for 20 years. Dead, dead, dead, won't even eat its favorite food, fallen trees. The source of soil fertility and the very basis of the terrestrial food chain: dead. Then the fires will come and spread the dead zone further...

And this from what the "experts" like to remind us was a very minor amount of radiation, from an accident that could have been much worse.

In time, with neither the energy resources to safely maintain or decommission plants, or safely store waste, surely many--if not all--of the world's 435 nuclear power plants are destined to produce similar destruction, covering large parts of the northern hemisphere with such dead zones, desert forests, frozen in time, and with few resources to devote to remediation.

To me, more and more, I see decommissioning as many of these nuclear "subsidy dumpsters" as possible, and putting our waning resources into creating dozens of "Onkalos," (very expensive underground waste repositories) as a necessary precondition to a feasible human future.

[Reply](#)



John Michael Greer 3/27/14, 3:27 PM

SLClaire, exactly -- the same logic applies to many other technologies, dealing with many other aspects of life. Scythe away!

Ray, that's a challenging row to hoe -- I hope it works well for you. The mismatch between too little insulation and too much sealing is unpleasantly common in houses of that vintage!

Jael, I see you haven't been following this blog for long -- we have a number of people here who are involved with draft animals in one way or another, and even more for whom a pile of horse manure is an opportunity, not a problem! Of course you're quite correct that animal muscle will be as important a source of power after the industrial age as it was before that age began, and it's good that people are working on that technology, too.

Jason, glad to hear it! Thanks also for the story about the Italian captain. I wonder how many people in the world's navies have been talking quietly about the end of the age of oil all along.

Jan, I hope Botswana does something constructive with the income from that coal.

Steve, I've heard of the *Hokule'a*, of course -- a splendid vessel, and a useful reminder that deepwater sailing is possible on a far simpler technological level than Gustav Erikson had to hand.

Daelach, exactly -- leaving the remaining economically viable cargoes well within the range of what windpowered shipping can carry.

Joseph, thank you. I wouldn't worry about being reasonable -- find the thing that's right for you, and let the far future decide whether it was reasonable or not.

K!EF, granted, but my understanding -- based on having a wife who spins and weaves, and talking to her about it -- is that there's a long learning curve there, and speed comes only with many years of practice. It may be less challenging when people have been doing it for a few decades.

Jonathan, let me make sure I've understood what you're saying here, as it's of some importance. For small cargoes -- say, 20 tons -- it's *already* cheaper to hire a sailing vessel with diesel backup than to ship it by ordinary diesel freighter? Do you happen to have any sense of when that started to be the case, and/or how many sailing vessels are working small-cargo runs at this time?

Mortal, yes, that's just one of the pleasant little legacies we're leaving for the far future. It's probably safe to assume that the new civilizations that rise out of the ruins of this one will think of us as something close to evil incarnate.

[Reply](#)



Eivind Berge 3/27/14, 3:45 PM

It should be pointed out that the so-called NASA study that is doing the rounds is actually not very good. Scott Locklin explains why:

<http://scottlocklin.wordpress.com/2014/03/23/bad-models-and-the-end-of-you/>

For one thing, the model doesn't even include non-renewable resources, so it has very little relevance for peak oil and the predicament we are actually facing. It also makes a number of other dubious assumptions, such as categorizing all humans as either "predator" or "prey" and nothing else. And the paper is only tenuously related to NASA.

[Reply](#)



Rocco 3/27/14, 3:47 PM

@JMG

I found the exchange between you and Joseph Nemeth, whose comments over time have been consistently coherent and clear-eyed, to be most helpful. Thanks to both of you.

[Reply](#)



steve pearson 3/27/14, 4:06 PM

Another set of books that gives a good feel of life at sea in the RN during the Napoleonic wars is Patrick O'Brien's Master & Commander series. The nautical details are good and they are a great adventure read.

One thing that was often an issue with cargo sailing ships was the load shifting in a storm and throwing the whole balance of the ship off.

@Cherokee Hey Chris, watched the fracking video you linked. That's terrible. That hadn't started, at least at any scale, when I left QLD in 2010. Poor people, poor land.

Regards, Steve

[Reply](#)**Glenn** 3/27/14, 5:59 PM

Jonathan Hutchinson said...

"But when that storm starts to roll in, I can guarantee the engine will be fired up and we will burn as much diesel as it takes to keep us (and the cargo!) safe. I imagine the cost per gallon could triple or quadruple before any sane captain would even think to forgo the auxiliary diesel aboard a sailing vessel."

Nonsense!

I would suggest that you read the appendixes on Storms in Bowditch, and Linn and Larry Pardey's "Storm Tactics". You have something to learn about the 5000 years of seafaring under sail that preceded auxiliary engines.

BMC Glenn Woodbury
USCG, ret.

in the Bramblepatch
Marrowstone Island
Salish Sea
Cascadia

[Reply](#)**Kevin** 3/27/14, 6:57 PM

Re Luckymortal's observations - I'm wondering how many of today's nuclear power plants will be underwater after a century or three of ocean level rise? If all or most melt down, and the waste is uncontained, what will be the severity of oceanic contamination worldwide? To speak truth, I'm afraid to find out. Future ocean voyagers might have to think twice about relying on fish as a source of sustenance for a long, long time.

[Reply](#)**AlanfromBigEasy** 3/27/14, 7:40 PM

My analysis is that the largest, most fuel efficient ships, steaming fairly slowly and burning fuel derived from wood# (or asphalt from Orinoco) will be "half" the solution and smaller wind jammers will be the balance.

Perhaps mixed with sulfur, an abundant burnable fuel that pollutes

In addition, transshipment depots should be set up at the Panama Canal, Suez, Singapore (with rail connections at each to nearby lands).

Such ships as Emma Maersk are more economic than wind when and where volumes exist to support them.

http://en.wikipedia.org/wiki/Emma_Maersk

Smaller and more time sensitive routes will be served by wind. Per tonne-km, this large ship should be cheaper than wind.

Example: trade between North, South & Central America.

One new Panamax freighter (all or partially container) runs two routes.

Chile to New Orleans (with transshipment @ Panama, offloading & loading there). New Orleans to Brazil, Brazil to New Orleans or East Coast, then back to Chile.

Rail service through Mexico to Panama will provide access to Central America and provide an alternative route to the US West Coast.

Many other routes will go to much smaller wind jammers.

BTW, other advantages of oil over coal are less labor (no coal shoveling) and diesel is much more thermodynamically efficient than steam. So the effective energy density advantage of oil over coal is better than 2:1 - more like 4:1 or 5:1.

[Reply](#)



AlanfromBigEasy 3/27/14, 7:51 PM

I forgot to mention that the reason bigger is more efficient is that, for a given hull shape, the wet surface area grows as the square of the dimensions (length, width) while the volume grows as the cube.

Generally speaking, cutting speed in half reduces fuel use for propulsion by 3/4ths (from memory).

The number of super size freighters may drop to a dozen world wide, or even less, depending on overall economic activity.

[Reply](#)



Pinku-Sensei 3/27/14, 9:37 PM

@JMG

"[O]ne of the perquisites of empire is that a lot of arable land that doesn't officially belong to the imperial power might as well do so, and can be used to replace land that's diverted to imperial projects -- pyramids, ethanol, or what have you. It'll be interesting to see what happens as America's empire continues to wind down."

True in general, but the U.S. is still a net agricultural products exporter. The U.S. may have access to a lot of the rest of the world's acreage, but it doesn't absolutely need to do so. Right now, the country can feed itself and still produce ethanol with corn to spare to export. Note I wrote "can," not "does," as the stats I quote from the following link demonstrate.

<http://www.foodsafetynews.com/2013/11/americans-dining-on-more-imported-food-than-ever/#.UzT27oWTIfg>

"U.S. food imports are experiencing brisk growth this year, up more than \$3 billion through the first eight months of the year.

In August - the most recent month for which import-export data are available - the U.S. exported \$10.15 billion worth of foods, feeds, and beverages, while imports in the same category totaled \$9.566 billion.

Our food exports last year totaled \$133 billion, while we imported \$110 billion worth of food, feed, and beverages. We are importing fish (\$17 billion), fruit (\$12 billion), and vegetables (\$11 billion) for our dinner plates, while exporting soybeans (\$26 billion), meat and poultry (\$18 billion), and corn (\$10 billion) to meet world demand."

If the U.S. is getting access to anything overseas, it's water in the form of fisheries and aquaculture. In terms of arable land, it seems to be at worst a wash for now.

The odd thing is that the trend is to import *more* not less as the empire starts to wind down. I don't know if that would be data that supports or contradicts your expectations at this point in the process. I could see it going either way.

[Reply](#)



John Michael Greer 3/27/14, 10:09 PM

Eivind, it's possible to challenge any scientific model of a complex phenomenon along these same lines, since any such model involves simplifications. I haven't yet had a chance to assess the study; when I do -- and that'll involve getting in under the hood and figuring out the researchers' presuppositions and assumptions -- I'll be prepared to offer an assessment.

Rocco, you're welcome.

Steve, what -- you're not going to mention the Horatio Hornblower books?

Kevin, good question. Some of them certainly will be, and so yes, fish may be a real problem for a while.

Alan, well, that's one speculation. I have my doubts.

Pinku-Sensei, thanks for the details! That's fascinating.

[Reply](#)



Redneck Girl 3/28/14, 12:30 AM

I haven't seen anyone yet mention what the canvas and rope is going to be made with for these 'new/old tech' sailing ships. Hemp of course! Du Pont managed to kill hemp production because they wanted to corner the market for their nylon rope. The legislation using marijuana as the excuse included hemp. During WW II the restrictions against hemp was lifted for the war effort.

About horses, one of the nicest horses at the stable is a beautifully compact Spanish Mustang filly, very elegant. I think she would be a perfect Dressage Pony, but she isn't long and lean like those usually are. Mustangs aren't for everyone because they are independently intelligent, they think for themselves and if they're convinced 'YOU' are a moron, they'll dump ya! Or act terminally stupid in regard to what you ask of them. There's another mustang that IS tall and elegant or he would be except for his feet which are quite large for his size. (Caused by the desert environment he came from.) He's a Nevada Remount Mustang likely Arab / Morgan mostly. A tough, thrifty, easy keeper like the filly and the little mare my young friend want's to give me.

Also in regard to horse manure, all those city dray horses produced a lot of manure which was carried out of the city to the truck farms that surrounded cities in those days. (Which are currently under subdivisions.) Is anyone old enough to remember the craze for those heavy antique glass cloches back in the 70's? Those were used to raise such delicacies as out of season strawberries for the city markets.

@ S.L. Claire, have you considered a pygmy goat? They're both a meat and dairy goat. They usually suggest a pair, (I have a wether and his mother), but if you spend a lot of time caring for them they make funny, wonderful out door pets and very good weed eaters cum fertilizers. They'll even produce mohair for you to learn how to card and spin! (In pygmy amounts!) If you want milk for food, cosmetics or soap, the nanny can literally have a litter, (as many as six!) but usually two to four, each about the size of a domestic cat. My nanny is only 20 inches tall at the shoulder and the wether is 28 inches at the shoulder. Wethers can be trained to harness starting at six months and make good little draft/pack goats if you need help bringing in your backyard groceries. (tic) ;D

Wadulisi

[Reply](#)



Marinhomelander 3/28/14, 1:08 AM

As to technology to help the transition, has anyone mentioned this site lately?

<http://www.builditsolar.com/index.htm>

"Plans, tools and information to help you build solar shed solar space heating, renewable energy and conservation projects.

Hundreds of projects -- from changing a light bulb to building a solar homes.

Design information and tools for building renewable energy projects.

An Experimental section for backyard inventors.

Nothing For Sale here -- just free ideas, plans, and information."

[Reply](#)



Cherokee Organics 3/28/14, 1:18 AM

Hi JMG,

Oh yeah, they're here all right, but there is no warm and fuzzy welcome for them. I understand that most of the gas is exported and most of the miners are foreign owned. It is not a good look.

You can see the decline in our agricultural exports in this fascinating link (produced by the Australian Bureau of Statistics) of the history of wool exports.

Note that after WWII the only spike in price was due to supplies made to the US government due to the Korean war. Other than that it has been all down hill. Flock numbers are up on those times, but profits are way way down.

[The Wool Industry](#)

The traditional export markets were to the UK. In recent times we export primarily to SE Asia and the Middle East. Our legal system has not really kept up with some practices in those countries and there has been a bit of controversy:

[Australian Wheat Board - Cole Inquiry](#)

Baksheesh in some countries is just the done thing, I guess.

Hi Joseph,

In order to learn to feed yourself satisfactorily from a plot of land, I reckon it can take possibly upwards of a decade of practice, errors and corrections before you are even close to that goal. I read recently that sometimes you have to kill a plant three times before you can quite truthfully say that you have learned something about it! Now, I may not be the sharpest tool in the toolbox, but I certainly can't guarantee today's availability of energy and resources in a decades time. Can you? For that is the gamble that you are taking, whether you acknowledge that gamble or not. Doing nothing is always a decision.

Hi Phil,

Exactly spot on! Oh yeah, they used to salt the meat too. Apparently that was a very common process before refrigeration. I seem to recall seeing a video with Hugh Fearnley-Whittingstall doing this process to pork that he'd raised. Am I correct in saying that the majority of the UK's food imports now come from either Europe or Africa?

Incidentally, Port Lincoln in South Australia now has fish farming as its main industry, but I believe that quite a lot of grain is still grown in that area. They have a good combination of reliable summer rain, lots of heat and fertile soils. There is a lot of quiet money in that town.

Hi luckymortal,

Has any plant actually been decommissioned or have they been just mothballed? I'm glad that there is nothing to frack around here, I have enough dramas without adding that one. I really feel for the disaster that is waiting in the ground water tables of those areas.

Hi Steve,

Yeah, Queensland and New South Wales are seeing a lot of that activity. Only when the last well is finished will anyone see the disaster that is left behind. I'd love to be proven wrong.

Regards

Chris

[Reply](#)



Marc L Bernstein 3/28/14, 1:35 AM

Very well stated -

I believe that Dmitry Orlov lives on a sailing vessel. Perhaps you will see him at the next limits conference.

I had never heard of Erikson.

Perhaps a list could be made of abandoned technologies that might be worth reviving. Typewriters could be included.

A revival of animal-based transport might eventually be worth reviving but we are currently a few decades from that. Local small grocery stores carrying food and essential domestic items, supplied by horse-drawn vehicles, may eventually compete with supermarkets supplied by huge trucks fueled by gasoline or diesel, but that transition is several decades into the future as well. Supermarkets will persist for awhile but may gradually become prohibitively expensive due to transportation costs.

Anyway, I'm rambling, thinking out loud.

Keep up the good work!

[Reply](#)



Mean Mr Mustard 3/28/14, 1:50 AM

Hi JMG,

Beware - the hedge fund empty suited pirates may attempt to [seize your fine vessel...](#)

Mustard

[Reply](#)



russell1200 3/28/14, 2:03 AM

I think you are putting the end of sailing too early.

Going into world war one there was still a very large sailing merchant marine. By numbers it would have been close to half, by tonnage something like 1/7th. But the sailing vessels were very vulnerable to German commerce raiders and U-boat deck guns. The general wreckage and destruction of the war hastened the end.

The most successful German commerce raider was itself a sailing vessel (disguised to hide its true nature) with an auxiliary motor.

The auxiliary motors were used to keep the ships off the rocks in storms. Thus the equation of auxiliary yes/no was going to have a lot to do with how valuable the boat/cargo was versus what types of waters it was sailing in. The first major naval campaigns with steam power occurred during the Crimean War. They were large masted vessels with small auxiliary engines to keep them off the rocks. This allowed the British to undertake the Finnish navel campaign (the one that likely is responsible for ending the war when St. Petersburg became threatened) in the tricky waters of the Baltic. The Baltic having also been one of the last hold out areas for oared vessels.

Solar steam on an auxiliary motor would be problematic if it could not hold the steam through the period of the storm. Once cloud cover sets in your standard irradiance of 1,000w/m2 will drop below 100 and stay there. The auxiliary got you in and out of ports, and kept you off the rocks. It might be perfectly adequate for the first two tasks, but it was the third that was likely to be the deal breaker.

[Reply](#)



irishwildeye 3/28/14, 2:09 AM

Change is already happening, the world merchant fleet is slowing down to cut fuel costs. <http://www.theguardian.com/environment/2010/jul/25/slow-ships-cut-greenhouse-emissions>

Here is another article that refers to the recent development of cargo ships cutting the engines and drifting when conditions allow it.

<http://www.motorship.com/news101/comment-and-analysis/the-wind-as-fuel>

[Reply](#)



Cherokee Organics 3/28/14, 2:30 AM

Hi Pinku,

Interesting stuff. Quote: "the trend is to import *more* not less as the empire starts to wind down."

Land fertility is a very difficult metric to assess on a large scale as industrial methods of agriculture can import seeds, water and fertiliser onto a farm. How does anyone even know what arable land means anymore?

In some parts of the so called "wheat belt" in Western Australia, it could be a fair call to say that the land is merely used as a medium to keep the plants upright. So I reckon yield is not a reliable indicator of soil fertility and/or potential production. It is complex.

The US is actually exporting dollars at the moment and some of those may find their way into the world agricultural markets.

Also, the population is not static, so it is very likely that at some point demand may exceed supply.

The numbers that you wrote of are really interesting.

Regards

Chris

[Reply](#)



latefall 3/28/14, 3:00 AM

Err, you all know that we'll have to burn through the fossil gas before we start thinking (big) about coal/sail again right?

<http://www.pmmonlinenews.com/2013/05/propulsion-is-lng-future.html>

I could imagine there's a bunch of niche lines that could actually be served profitably by sail - but if you have a lot of unused fossil driven capacity sloshing around, they'll often be there first - even if it eventually turns out not to be profitable.

[Reply](#)



latefall 3/28/14, 3:03 AM

I am somewhat surprised the Baltic Dry Index (http://www.wikininvest.com/wiki/Baltic_Dry_Index) did not come up yet. It seems one of the more useful financial metrics to know about. The linked article also has some of the technical/operational factors that are useful to know.

That being said the shipping industry may be more skeptical of BAU than others because of

- a) the recent hiccups and turmoil
- b) to make money it behoves you to think big (also in systems) and long (e.g. couple of decades)
- c) many people there live in "two worlds" - one comes with a couple very plausible NTE

scenarios, which foster a culture of dealing with uncertainty and risk, thinking things through, asking "what if".

This would explain all the salties coming out of the woodwork here.

[Reply](#)



Unknown 3/28/14, 3:20 AM

(Deborah Bender)

The latest farm bill allows "research" programs for the cultivation of hemp in states whose laws permit growing of marijuana. We may be able to rig our ships with hempen lines by and by. (Cultivation of hemp for industrial uses was outlawed in the US in the 1970s.)

A pair of horses is not strong enough to haul a loaded tram safely up a steep grade, which is why Andrew Hallidie's cable car was a great invention for San Francisco. Originally they were driven by coal powered steam engines. After the earthquake, the system was converted to electric motors. It's a pretty efficient system: before 1982, one 750 horsepower engine powered three lines simultaneously, with multiple cars going up and down steep hills at a walking pace.

Those potato sprouts will make you sick if you don't cut them out before cooking the potato.

[Reply](#)



Yupped 3/28/14, 5:15 AM

Been working in NYC this winter (have to earn some cash to pay for my life of summertime LESS). Spending a lot of time down at the South Street Seaport where a couple of four-masted cargo ships - the Peking and the iron-hulled Wavertree - stare down the canyons of Wall Street. They are beautiful to look at - solid and uncomplicated, and obviously requiring a set of physical skills and courage to operate that you won't find in the financial district, or anywhere else most likely.

Built in the 1880s and early 1990s I suppose they are about as old as our modern industrial and financial system. The Peking is in need of repairs and a long-term home, but seems solid enough to me. It'll no doubt be bobbing along happily somewhere in another hundred years. I wonder what those Wall Street towers will look like then?

[Reply](#)



latefall 3/28/14, 5:29 AM

As far as I can tell shipping is sick and they know it. I am not sure if they have a diagnose yet. Ask Maersk or CMA CGM how happy they are to get a bunch more of these huge ships. Or ask Daewoo DSME on their plans for the future (hint: renewables, or Odense Steel Shipyard).

All in all it is an interesting scenario the way I imagine it:

- wealth pump winds down/moves to China, shipping substantially decreased
- no need to order more capacity (catabolic collapse) for a good while, good for rates
- reorientation of remaining industry, (very?) small (one time) increase of demand for non-locally produced stuff, aka re-shoring
- more equal material "relative wealth" distribution, less need for shipping stuff around
- possible change of weather patterns, sea level, concentrations of precipitation, etc. - increased requirements for transport
- oh and once the navy gets laid off/worse contracts, the pirates will be back for good

Now, if you have a bunch of huge ships and only very little stuff to ship you can use remaining capacity for cheap fuel. This is not necessarily the case for handysize ships - on the other hand - maybe they'd be too big still. I would really like to have a chart of ton*km/capita over the last 200 years.

What I heard is that WWI took out the windjammers rather than supply/demand economy. "Reintroducing" them in scale in the face of booming fossil fuels (and later nuclear reactors, etc) was a tough proposition.

Oh, and on the 1000 year hull - annual attrition rate 3% of sailboats vs 0.9% of Flying P-Liners (well made windjammers) in the early 20th century - supposedly a Bureau Veritas number.

I'll try to get some diversity on the recommended reading in here: the Seeadler under Luckner (interesting fellow), a windjammer that was on the predator side in WWI.

https://en.wikipedia.org/wiki/SMS_Seeadler_%281878%29

and here's some nuts and bolts about how (not to) handle such a windjammer:

<http://www.europe.canterbury.ac.nz/conferences/euro2003/paper1.pdf>

I agree that knowing and keeping a trade alive is often very useful in the end - but I sometimes feel the "love of the ocean approach" has its own merits.

Last bit that ties in a little with pirates and supply chains, a merchant sub:

https://en.wikipedia.org/wiki/German_submarine_Deutschland

Have a look at what it was transporting... yes, but it was not only drugs ;)

That reminds me I ran into an article on the rubber front:

<http://www.fraunhofer.de/en/press/research-news/2013/oktober/fraunhofer-and-continental-come-together-when-the-dandelion-rubber-meets-the-road.html>

[Reply](#)



Phil Harris 3/28/14, 5:37 AM

@ Pinku-sensei

(JMG butt in if you think it worth it.)

It is interesting (your comment) that US is importing so much high-end (money value) food. Significant parts of the world have continued to trend 'up-market', not just the US. It was very evident in China where big increase in fertilizer use 5 years ago was going mostly into up-market horticulture. They import more Soya for livestock feed.

We are reminded that middle-class 'US-type' eating patterns may not have peaked. BAU is not dead yet!

One of the early arguments for ethanol in the EU as well as in the US was that farming had been subsidized to not grow food - "set-aside" - and it was a cheaper subsidy to grow corn for ethanol! I remember that bringing US land back into cultivation was anticipated by US traders who cornered for one year much of the world supply of Potassium fertilizer - the price rocketed for farmers in the UK. There is some pretty good imperial economics for you!

I wrote the following in 2009 about economics of basic calories in USA. Do you have any update on these numbers?

Trends have been driven by profitability, and in the USA most of the monetary value of agriculture is 'up-market' in the livestock sector. Slightly over half is provided by livestock, slightly less than a quarter by horticultural crops and, less than a quarter by primary production, grain and oilseed crops (the remainder comes from cotton and other commodity crops).

Just a thought - Food Banks in more affluent countries like yours and mine may be just a cheaper way of subsidizing the poor, using essentially the lower-end surplus product; fats, homogenized meat, sugars and starch?

best

Phil H

[Reply](#)



AlanfromBigEasy 3/28/14, 5:38 AM

I believe that the issue of LONG TERM nuclear waste is vastly over stated.

The most dangerous biologically active isotopes are Strontium 90 and Cesium 137, have half lives of 29 and 30 years respectively. None of the compounds of Plutonium are biologically active.

Carbon 14 results from atmospheric atomic explosions, but not nuclear power. C14 in the biosphere jumped by about 1/3rd in the 1950s and 60s (from memory) and has since declined significantly.

About 95% of both isotopes currently in our bodies come from atomic bomb tests - Chernobyl & Fukushima added little Sr90 & Cs137 and no C14. Time is already reducing these radioisotopes and 60 more years will reduce them by 75% more. 90 years 87%, etc.

I am afraid that atomic bombs are likely to be used in our future, and the extent will determine the impact.

Atmospheric tests were USA 219, Soviet Union 229, UK 12+, France 50, China 23.

Absent full scale atomic war involving two of the three major powers - Russia, China and the USA, it is difficult to imagine an atomic war that would detonate as many weapons as have already been detonated in the atmosphere or sea.

OTOH, nuclear waste, even if badly handled, will add little to the biosphere even in the worst case (Chernobyl & Fukushima).

[Reply](#)



latheChuck 3/28/14, 6:36 AM

On modeling complex systems: Back when I acquired my first computer, and couldn't use it as a way to render other people's entertaining work, because the Internet had not yet been invented, I thought I'd do some simple system modeling. It didn't take long to discover that all of my model variables did one of two things: exponential decay or exponential growth, often with a sinusoidal ripple. Thus, I learned by experience what I could have learned abstractly, that ALL systems of linear difference equations have only such solutions. (Difference equations are very closely related to differential equations, but easier to model and harder to solve analytically.) It was a valuable lesson! Now, when some study shows "exponential growth/decline leading to disaster", I ask "Well, what did you expect those equations would give you?" Not that such models are useless, though. They can help us change the scale of our attention, relating changes of this parameter or that to the overall outcome. But a model is to be played with, not to be believed.

[Reply](#)



latheChuck 3/28/14, 6:53 AM

Re: population shrinkage, from last week's essay. Ignoring the arguments about whether average birth rates and death rates are historically supported, it seems to me that the core idea has been obscured. A population decline of 3% per year (for whatever reason), if sustained for 100 years, reduces the population by slightly over 95%. This is a very simple calculation, which ignores lifespan, so maybe it would be more accurate to phrase it this way: if 3% fewer babies are born every year, then after 100 years, less than 5% of the original number will be born. In the long run, the result is the same. It doesn't require plagues, warfare, or famine, or anything else so traumatic. (Here's the calculation: x raised to the 100th power = 0.05. Solve for x .
 $100 * \log(x) = \log(0.05)$.)

$\log(x) = \log(0.05) / 100.$

$x = 10$ to the -0.01301 power.

$x = 0.97...$

So, if every year is 97% like the previous year.

After ten years, you're at the 74% level; after 20, 54%; after 100, 4.7%.

[Reply](#)



Justin Patrick Moore 3/28/14, 9:02 AM

Bottles of expensive Scotch will surely be a hot commodity in the coming times. Good thing I live close to Kentucky, where cheaper Bourbon will still be made. I think Kentucky could have a bright future. Open a red light district -Northern KY has operated one more or less anyway. Legalize marijuana. Keeping growing tobacco, and raising horses and they could be one of the richest commonwealths in the U.S.

...Anyway, I enjoy these posts and may need to put some bottles of Islay in the cellar.

[Reply](#)



Jael Edgerton 3/28/14, 9:15 AM

Mr. Greer, please accept my apology for unwarranted defensiveness. I think I may have confused your blog community with the internet at large, which it certainly is not. I am glad to read there are others like my family in attendance here. Thanks, sincerely, for your fascinating posts and for providing a virtual gathering place for people who care about the future in light of the past.

[Reply](#)



Glenn 3/28/14, 9:24 AM

Panamax Fish,

Regarding Alan's hypothesis of large vessels transshipping at Panama; no matter how large the ship (and even steel vessels have limits) it will cost more than taking the same cargo through the canal in a Panamax vessel. Also, North South rail can't compete with any ship. If you have fuel for trains, ships will use it more efficiently. Electric trains with power from sustainable sources? In a technology that constrained I think large windjammers will still be cheaper than trains.

We passed "Peak Fish" in the oceans in 1992 (Western Pacific Fisheries Management Council 1997). Fish are already a big problem. Submerging nuclear plants, not to mention industrial chemical sites will make it even worse, at least locally. Future piscavores will indeed regard us as at least thoughtless, if not outright _evil incarnate_.

Glenn

in the Bramblepatch
Marrowstone Island

Salish Sea
Cascadia

[Reply](#)



John Michael Greer 3/28/14, 10:20 AM

Girl, there's been some talk about ropemaking facilities, but you're the first to bring up hemp. We're well on the way to legalization -- as Colorado's state coffers fill up with hemp-related tax money, every other state has got to be watching and drooling -- and industrial hemp production will follow, probably very soon after the current financial economy resets (via drastic deleveraging) and the productive economy is no longer held quite so thoroughly hostage by it.

Marin, no, and thank you for doing so.

Cherokee, thanks for the links. I hope your compatriots are starting to ask themselves how they're going to pay for imports a few decades down the line.

Marc, a list of technologies worth reviving might be worthwhile -- I'd put printing presses ahead of typewriters, but that's because they're so much simpler to make. Still, a good point.

Mustard, I'd say make the hedge fund pirates walk the plank!

Russell, fair enough -- in that case solar generators charging batteries might be workable, but once again it's a matter of cost vs. weight/cargo space taken up.

Irish, thanks for the data points!

Dmitry, fascinating. If that's viable for very large masts, spars, etc., it might facilitate the return of windjammers.

Latefall, we'll be talking about those allegedly vast supplies of natural gas in an upcoming post. Many thanks for the links!

Unknown Deborah, hadn't heard about the farm bill. They're really trying to build a constituency for legalization, aren't they?

Yupped, they'll be steel skeletons with sea water lapping at their feet, being torn down for the metal. That's my best guess, at least.

[Reply](#)



John Michael Greer 3/28/14, 10:24 AM

Alan, like most people these days, you're neglecting the fact that radionuclides don't necessarily become safe when they decay. Many of the components of nuclear waste go through a whole string of decay processes, turning from one element to another and emitting varying levels of radiation in the process. If any of my readers have an up-to-date book on nuclear physics to suggest, I'd be glad

to recommend it.

LatheChuck, granted, but a mathematical model can also show flaws in a purely narrative one -- for example, the narrative of perpetual growth. As for the issue of population contraction, thank you -- yes, that was what I was trying to point out, of course.

Justin, yes, and those are exactly the kind of luxury products that have been the keystone of long distance trade for a very long time. Have you considered a career in distilling?

Jael, not a problem -- this is not your typical online forum! If you work with horses, or are simply well informed about them, please do contribute ideas here; there are readers who don't have that background who want to know more.

Glenn, that's my guess as well. Mind you, as total cargo volume contracts, I suspect the really big container ships will go the way of the biggest of the windjammers -- as one of my other commenters pointed out, the 8,000-ton monsters weren't economical to operate, and were replaced by smaller (though still big) tall ships.

[Reply](#)



AlanfromBigEasy 3/28/14, 10:39 AM

You may not have understood my point.

I said "new Panamax" freighter, so one that can transit the new 3rd set of locks.

However, upon calling at one end of the Panama Canal or the other, some containers would be offloaded and others loaded. Those from Central America (for example containers full of bananas and coffee) and others from other vessels transiting the Panama Canal.

Example: New Zealand to Europe windjammer might drop off some wool and pick up some bananas & coffee (and copper from Chile) at the Panama Canal. The massive freighter bound for New Orleans might drop off cargo and pick up the wool as well as bananas & coffee.

China is in the midst of building three standard gauge rail lines to the EU. The Trans-Siberian, despite operating in a very rough climate and fairly rough terrain, is economically competitive with interior Europe.

I think that even without the circuitry advantage, electrified rail can beat windjammers. Labor & speed certainly favors rail.

Remember, electrified rail is competitive today, wind hammers are not.

[Reply](#)



steve pearson 3/28/14, 12:24 PM

redneck girl, I had heard that the main campaign against hemp was by W.R. Hearst. He had large

timber holdings and hemp was a competitor for the paper market. He also had a newspaper empire, so easy to get his message across.

The whole campaign demonizing marijuana was supposedly his idea, because he couldn't really make a valid case against hemp itself.

I believe the U.S. constitution and declaration of independence are written on hemp.

Regards, Steve

[Reply](#)



NickVictoryofthePeeps83 3/28/14, 12:27 PM

JMG,

Longtime reader, sometime commenter, and general admirer here. Must say I really love this appropriate tech post vis-a-vis wind sail technology being a part of the future. For the first time in awhile, 2014 has brought me a sense of hope about the future. And it's not the wooly-headed hope, but the kind of nuts-and-bolts practical kind of hope. I think the catabolic collapse approach, and the general mentality behind it, is actually starting to seep in and find cracks in the concrete, so to speak. Nafeez Ahmed, one of the few in the mainstream media who is neither in absolute denial about collapse nor is he absolutely positive about imminent apocalyptic doom, certainly seems to be channeling your kind of thinking. So there's hope, JMG. Last time I wrote you, I was severely depressed. I can't say that I feel that way any longer.

[Reply](#)



myelectricpants 3/28/14, 12:54 PM

JMG,

I was wondering if you would ever write about the future of canals, or if you already had and I have missed it. I grew up in central Maryland, visiting Harper's Ferry and the great falls of the Potomac and being told of the importance of canal shipping, until the railroads took over. It sounds like some shipping has picked up on the Erie canal in recent years. It is easy to talk about big important canals like Panama and the Suez, but local canals were just as important in their day, maybe more so.

Thanks,
Josh

[Reply](#)



Robert Beckett 3/28/14, 1:30 PM

JMG, Ugo Bardi has just republished a five year old essay featuring Marcus Aurelius and a wise druid - whom did he have in mind, I wonder?

Love the photos in the blog these days, but is Capt Erickson not a dead ringer for Alec Guinness? Dreams of a sea-worthy catamaran plying the Pacific coast from Juan de Fuca to La Manzanilla, small cargoes, mostly for the pleasure of it.

I saw a lot of discussion here last week about burning wood for space heat, and nary a mention of

intelligent passive solar building techniques.

Passive solar first, wood as back-up, and for a low-tech, low weight Trombe wall, to really get performance, think PCM (phase change material). <http://netzerohome.blogspot.com>

Best to all, Robert Beckett

[Reply](#)



Adrian Ayres Fisher 3/28/14, 1:33 PM

JMG, As you've circled back to a discussion of green wizardry, I am noticing what seems to be a tad more urgency in your tone regarding our need to work at whatever low tech skills we have. Or perhaps I'm projecting the sense of urgency that fuels many of my own actions and preparations these days.

So: I'm putting in some *Ribes americanum* this spring in my ongoing polyculturing of the back yard, and am also propagating some osage orange trees (for folks who live elsewhere).

Re pre-WWI houses--the question of sealing and insulation is a gnarly one. If you have such a house, it's worthwhile learning about its construction in detail, including why it was built the way it was, before you get the local energy efficiency contractors in to insulate and seal. As we prep our old house for the future, we are moving carefully.

As an inlander, the discussion of sailing by so many experts is most interesting.

I'd like to point out again (as you have in past posts) that the abilities to build and maintain--non-electronic--democratic social structures and processes, and organize and manage projects involving other people are also technologies worth practicing and perpetuating. I say that because, in part, without these skills, rocket stoves and sailing ships won't do much for us. These seem to be skills also in danger of fading away if not nurtured.

[Reply](#)



Agent Provocateur 3/28/14, 1:48 PM

JMG,

Your point is well made that the economics of energy determines the technology used in a particular application. Noncommercial applications have a little more freedom from the economic realities of energy but are still ultimately restrained by them.

I'd like to look a little closer at the issue of costs. There are always two basic costs for a tool. These are the up front capital costs of making/purchasing the tool and the running costs of maintaining and using it. Both costs are determined by energy source costs to some extent.

In your example of wind versus coal/bunker/diesel technology to power ships, you did not focus on capital cost much; though you may have implied that these were about the same and then later lower for wind as this technology went out of fashion for short hauls.

Now wind energy itself is free but diesel fuel energy, even if cheap, is not. So why did diesel power technology trump wind powered technology economically? Certainly there are capital costs for both wind power (sails, rigging, etc) and diesel (engines, gear boxes, shafts, propellers, etc). Of the two I don't know for a fact which was more expensive, but I'll bet diesel technology was significantly more expensive. Higher tech normally is. For small craft, a power boat is far more expensive to buy and to run than an equivalent sized sailboat. Its all the machinery and fuel that costs the extra money.

So lets assume diesel technology capital costs were in fact more expensive. So again, why did diesel power win out over wind power as it so clearly did? It would have to be that the running costs were significantly lower for diesel on the larger scale. Even if well automated and powered assisted, a wind powered ship requires a much larger crew than a diesel powered ship of the same size. Apparently people cost more than diesel fuel. That's my guess as to why diesel won out economically over wind.

If people become cheaper than diesel, and the capital costs of retrofit to sail are not prohibitive, perhaps we will see a reversion to wind power.

My point in the forgoing is to look at where splitting capital and running costs takes us in an analysis. I don't think the prospects for household or local grid PV are as good (see my next comment).

[Reply](#)



AlanfromBigEasy 3/28/14, 2:09 PM

Per local news reports in Kentucky (where I am caring for my father), Kentucky produced 85% to 90% of US hemp the last time it was legal. The state has made hemp legal, if it is ever legalized on the federal level. Plus regulations just in case (plant seed from state approved vendor, declare acreage to state, etc).

It may be the best crop to replace tobacco.

[Reply](#)



Agent Provocateur 3/28/14, 2:18 PM

JMG,

Lets consider PV as a source of electrical energy for a home. I'm not talking about FITs here. The only applications that I am aware of where PV currently makes sense economically is when the capital costs of PV are much lower than running a line from the grid (i.e. remote locations). The running costs of grid power for a household is more expensive than PV; nonetheless, on balance right now, grid power is still more economic.

How does a person determine "on balance"? Take the capital costs (including finance) of a standard household PV system (not FIT) and amortize these over the life of the capital items and determine a monthly average cost. Add this to your average monthly running costs of PV. Then compare the

value so determined against the cost of average monthly equivalent grid power. To be really thorough, you should factor in the cost of your own labour for maintenance of the PV system.

Here's a back of the napkin analysis: Assume a \$20,000 PV household installation amortized over 20 years. Keep it simple with no financing and no running costs. This gives $\$20,000 / (20 \times 12) = \83 per month. I currently pay \$83 per month for 415 kWh/month (no electric clothes dryer ... \$0.2/kWh). Will such a \$20,000 PV system give me 415 kWh/month. I'm guessing the answer is: "No." How far would grid costs have to go up, or PV capital costs have to come down, to breakeven. As these changes likely? I'm guessing the answer is: "No."

If the preceding is fundamentally wrong, I'd be happy for someone to give me more realistic numbers.

PV is a mature technology. Capital costs have already come down considerably. Assuming no further order of magnitude reductions in PV capital costs, these costs will still be prohibitive save for those with money to burn for "vanity power" (no offense to those who have it ... I'm just jealous).

As grid electrical power running costs (i.e. household electrical bills) go up due to higher fossil fuel costs, will PV become affordable? I doubt it. Rising grid cost will result in less use ... maybe down to the level of standard household PV installation outputs. And grid power will likely become just as intermittent (like it is in the third world today). Even still, PV costs will go up as well for the same reason grid cost did ... because fossil fuel costs are hard baked into both. The ratio of costs (PV to grid) will no doubt change, but even if this tilts in favour of PV, it matters little. We will all have less money then so the financing may well gobble up the difference.

Now there is a price ceiling for all energy relative to GDP. Once this has been reached, grid power producer revenues cannot be increased by raising price. As the producer costs finally exceed revenues, government subsidies will prop producers up (which of course they already have) until these governments can't obtain credit. No government credit is the endgame of a national or regional power grid and much else.

My basic point: if PV is not economic now, I'm not sure it will be in the future. In the event of the end of a national or regional power grid, one needs to look at what electricity is really needed for. One will see the end coming so there is no panic. There will be years of escalating bills, rotating scheduled blackouts, and rising bond rates before the end. In my case, the only reason I really need electricity is for pumping water. A windmill or small generator pumping to an indoor cistern (which I have already) will do the trick nicely. Failing that, we have a well we can draw water from by hand. Other people will have other priorities.

Just some thoughts.

[Reply](#)



Ray Wharton 3/28/14, 2:19 PM

@Marinhomelander

Thank you so much, I cannot overstate how much time and effort in research you have just saved

me!

[Reply](#)



John Michael Greer 3/28/14, 2:51 PM

Nick, I'm delighted to hear that you're feeling hopeful! Yes, I've noticed that the deathgrip of the "progress or apocalypse" meme has finally started to slip -- and I've also noticed that my monthly page views here have been rising steeply of late. It may yet be possible to accomplish some things on a larger scale.

Pants, I see your crystal ball is in working order. Yes, I'll be talking about canals; the town where I live these days used to be a major canal port, so it comes readily to mind.

Robert, has he reprinted that? I'm pleased -- it was a good essay, and makes a point I plan on discussing in much more detail as we proceed. Of course you're right about appropriate tech ways of home heating; it'll probably be worth putting a post into that one of these days.

Adrian, you're not imagining the air of urgency. The closer we get to the next serious round of crisis -- and while it's hard to say exactly when that'll hit, I think we're closing in on it -- the more crucial it is for people to get up off the sofa and get working. There's essentially no time to spare at this point.

Agent, I'm not at all sure whether it was labor costs, the much greater predictability of powered ships, or some other factor that made windjammers unprofitable in the face of diesel -- might be worth some research. As for PV systems, no argument at all -- my working guess is that salvaged systems powering very modest 12 volt applications will play a large and helpful role on the way down, but unless someone comes up with a cheap, low-tech way to make PV cells, that's about it.

[Reply](#)



Glenn 3/28/14, 3:08 PM

'AlanfromBigEasy said...

"You may not have understood my point.

I said "new Panamax" freighter, so one that can transit the new 3rd set of locks.

However, upon calling at one end of the Panama Canal or the other, some containers would be offloaded and others loaded." {Snip!}

"I think that even without the circuitry advantage, electrified rail can beat windjammers. Labor & speed certainly favors rail.

Remember, electrified rail is competitive today, wind hammers are not"

You are correct, I misunderstood you. I still beg to differ on electric trains versus sail though. Speed advantage to trains, yes; labour per ton/mile? I don't think so. Building _new_ large sailing ships is not currently competitive with an existing fleet of oil burners. Starting from scratch, they might be. At any rate, costs per ton/mile by ship are still way cheaper than trains using current fuels. I am projecting that the advantage will remain with ships when cheap oil is gone (i.e. no relative change).

This brings up the time value of money. Current finance models of deficit financing drive speed at all costs; hence factories operate 24/7 even when the process in question doesn't need it (although many chemical and metallurgical processes are more economical if continuous). This disproportionately benefits faster transport modes. In a stable, non expanding economy, not dependent on credit financing, this will change. This is a factor for many other good ideas, such as human and animal powered intracity cargo movement (cargo bikes, animal drawn wagons). There is obviously a speed below which the economics won't even support starvation; but workable limits are obviously much lower than today's, as viable cities flourished for thousands of years before we used fossil fuels.

Glenn

in the Bramblepatch
Marrowstone Island
Salish Sea
Cascadia

[Reply](#)



Glenn 3/28/14, 3:20 PM

John Michael Greer said...

"Agent, I'm not at all sure whether it was labor costs, the much greater predictability of powered ships, or some other factor that made windjammers unprofitable in the face of diesel"

As far as I can tell, labour costs, average speed (averaging calms and storms for a 20 knot clipper v.s. a 9 knot powered vessel gives the advantage to power) and maintenance. Modern people forget how much damaged gear costs to repair in a sailing ship, and how much of it was damaged on each voyage. Per ton/mile of freight, it exceeded diesel maintenance costs. Bunkerage for coal worked against steamers, and it was only the Suez and Panama canals that made them viable for long distance freight. Diesels were the icing on the cake.

As I mentioned before, the time value of money and deficit financing were and are hugely influential. One of Erikson's tactics was to pay cash rather than finance a vessel; and he was buying old beaters.

Note on materials. In the steel ships, masts, lower yards, standing rigging, and much of the running rigging was steel. Sails and fiber rope were usually hemp. "Canvas" as a word, is supposed to be derived from "Cannibas".

Glenn

in the Bramblepatch
Marrowstone Island
Salish Sea
Cascadia

[Reply](#)**latefall** 3/28/14, 3:21 PM

re: nuclear decay

You may be looking for something like this: www.oecd-neo.org/science/docs/pubs/nea6090-transmutation.pdf - fig 1.2 on page 9 and fig 1.13 page 27 (after a quick skim). I'd be interested which curve we are following in the latter, and who is paying.

There is not just bomb tests, you know there is enough Plutonium-238 for everyone <http://www.osti.gov/scitech/servlets/purl/4689831> those were only 2 kg vaporized in the sky, but you only need 4E-8 g to max out your "allowed dose" for a year. If you can't get the stuff out of your system via biological half life (which is a tad shaky as a concept) because you keep eating the stuff until the physical half life takes care of it...

Have a couple of accidents and concentrators on your plate within say 100-300 years and things start to look different.

Here's a possibly balanced link collection (much of it in German) https://wiki.piratenpartei.de/AG_Nuklearia it is the "pro nuke faction" in a rather "no nuke" party, which is very cyber and techno-friendly.

[Reply](#)**peakdoc** 3/28/14, 3:23 PM

I bought my slide rule on eBay after reading your last blog on the subject - thank you thank you thank you. It's a 1960s bamboo model. I haven't had chance to practice with it yet though.

[Reply](#)**latefall** 3/28/14, 4:01 PM

re rail vs ship

I am still pretty amazed how low the ton-mile still is for containers (high end sea freight).

If you take the big new ships (yes, unrealistically in optimum conditions): you get one container (20 tons or so) 100 nautical miles with approx 5 l of fuel, that is 37 km/l, or 87 mpg - for a 20 t payload. A bottle of wine costs you 35g of sweet crude to get it over the ocean. The last mile from walmart is far worse I assume. Smallest ships (1 kTEU) use about double the fuel of largest ships (11 kTEU). Large ships would not be at good capacity more often though.

Sure you have to pay maintenance on the ship - but not the ocean :).

I think the relative cost was something like 30 x ship = 2 x rail = 1 x truck = 0.1(?) x car. And I am not sure about air freight. However there's increasing uncertainty in the numbers anyway as they rely on a big tech ecosystem.

By the way IIRC air travel/transport can combat global warming - if you fly during the day and reflect back more sunlight. Ideally lower than is fuel efficient.

[Reply](#)



latefall 3/28/14, 4:04 PM

On sailing my take is that I won't hold my breath for large scale sail transport to return from the horizon - even though (or rather because) I like the idea. Most people like this stuff so this is really one thing that will not die out for lack of interest. I'd be more interested in the less obvious and sexy stuff that may be learned about on very old bills of lading.

I'd also put in a "be careful what you wish for": we could the sails altogether and get going on galleys! Or even better we team up, you use the windjammers, and I run a doldrum service with galleys. I might have to wait for the radio active fish population to bounce back and I can feed my crews. I'd run a very green ship to be sure. I'd take anyone for a contract (minimum about the time it needs to pick up a lethal dose of radiation) with low pay but a high pension! Same sex boats only of course to get down that birth rate and take advantage of subsidies. Well, and of course I'd have to offer some hope in order for the envisioned death rate to be acceptable:

Now and then (once I make sure they have no radio) seizing of troublesome customers...

Another business venture would be making basalt fibers close to an active volcano. Use a setup where the platinum(!) hardware can be salvaged if things go wrong...

Reply



latefall 3/28/14, 4:14 PM

Enough of the "good ideas".

@ Joseph Nemeth, JMG

The feasibility/viability thing very often hinges on materials. A lot of technology is limited by the materials (in quality and quantity) available for making it. So if you understand the material (we really still haven't all the way), you get investment together (quantity bottleneck) you generally end up fighting thermodynamics (or pests) on one side and your customers on the other.

Embodied energy (<http://perigordvacance.typepad.com/files/inventoryofcarbonandenergy.pdf>) should give you an idea of how hard you have to fight (much fossil fuel goes into each). However you'd really need to break it down into energy per "desired function" e.g. tensile (or compressive, or fatigue) strength, which makes a big difference. And then you'd have to look at the life cycle assessment (corrosion, chemical, UV resistance) to break it down to ROI times. For boats without trees look at <http://opensourceecology.org/wiki/Ferrocement>.

It would greatly help design and conception if we had more accessible public databases on this I guess.

Recap time, progress in understanding materials (making masts, steels, polymers, composites, silicon), all the stuff going on in the background like finding or not finding more oil, gas etc result in a game with moving target and a staggering drunk shooter.

Or possibly "scrabble" (nice one!) with missing pieces.

If I was one of Erikson's sons or daughters and you'd have wanted a really big fleet of windjammers - why sure I'd invest in motor ships: as an incubation device, only to get the money together to build even more windjammers. A couple of ships still exist as museums or restaurants, biding their time. Also, Erikson did invest in motor ships himself.

Is that not the defining quality of most business persons - to view things from a monetary/opportunistic perspective? They would not have a lot of money by letting all the oil underground, or someone else have it.

Today the story may play out differently of course. Yet - who knows if the daughters are not investing in SkySails and the like?

That being said, I wonder if one couldn't do "fair weather blimp logging" pretty soon. I mean if helicopter logging seems viable - why not? Can be done quite sustainable I reckon. Of course it would use hydrogen (maybe really with the N-layer Alan suggested) and go poof once in a while before you get the hang of it. But you'd really only have to make sure it doesn't light up the forest. It could dump an equivalent amount of compost on the way and have a bunch of drones (or people) scout for good specimens to pick up. Then adjust course, anchor, drop crew, attach another anchor to the tree in question in a couple of points, tension line, cut base and hold on to a branch ;).

You could even do a down-wind operation where you ship blimps back up wind on ground, or wait till the wind is right to go back. That way you need very little propulsion, etc. You only need to fly from one surface road/rail/stream to the next if you like. Another material thing could help with a gas tight envelope: graphene (or expanded graphite maybe) as polymer additive.

Another thought I had was improving the intermodal options of the big(gish) container ships. Imagine they have a layer or two of containers with sturdy goods for out of the way places on them. They rendezvous with smallish 1-5 container capacity (sail)boats on the way that pick up a container after it was unceremoniously dumped in the water, and move it into the out of the way port. You might be able to avoid enough of the costly last few miles (also port congestion) to make some slow money.

[Reply](#)



latefall 3/28/14, 4:16 PM

@Ray

On general note - you know about this, right:
<http://opensourceecology.org/w/images/9/9e/Proposal2012k.odt>

What is your take on it?

I think they do a pretty good job at techno-scrabble. I hope they make the 50 points extra for using all pieces.

I also ran into this site today which is a good bit more accessible
<http://www.madehow.com/index.html> to the lay person.

[Reply](#)



GreenGoth 3/28/14, 5:50 PM

I was reading along the many wonderful posts and thinking, "But what about HEMP?" And was not disappointed when regular commenters posted about that wonderful source of rope, cloth, paper, food, etc. (Big health food supplements import business from Canada...)

Eagerly awaiting publication of journalist Doug Fine's "Hemp Bound - Dispatches from the Front

Lines of the Next Agricultural Revolution", following his scathing (and hopeful) "Too High To Fail - Cannabis and the New Green Economic Revolution" on the disastrous, incredibly costly and counterproductive "war on drugs" and the medical marijuana industry's "camel's nose under the tent flap" gradual re-legalization of this extremely useful and long domesticated plant in human use around the planet since prehistory.

Older family members in farm country recall growing hemp for industrial uses in the olden days, then after it was outlawed, being paid to eradicate the escaped "evil weeds" along roads and ditches where it was fending nicely for itself. They report if you smoked it all you got was a cough and headache.

[Reply](#)



GreenGoth 3/28/14, 6:10 PM

Re: our increasing importation of fruits, vegetables, fish, etc. in comparison to exports -- definitely a symptom of affluenza and the oil-subsidized expectations that we should always be able to get any fresh fruit, flower or vegetable we want, any time of year, wherever we are.

I hear people complaining at the farmers markets when they can't find locally grown berries, stone fruits, melons, florist-style cut flowers etc. in January when all the supermarkets have them (shipped from Chile, Peru, etc.) I recently had to point out to a supermarket produce manager that no, blueberries from Chile and pears from Peru don't belong in their "locally grown" section of a California grocery store -- false advertising or at best, serious ignorance of geography....

And let's just forget about the inundation of plastic trinkets, toys, electronic amusements and cheap-cheap disposable fashions filling so many of those container ships while we export our non-renewable resources and still lag in the "balance of trade". So no, when the impact of peak oil really hits home, the shipping volumes will plummet with re-shoring the production of necessities and "consumers" (hate that term) lacking fun-money to blow on luxuries and junk.

[Reply](#)



AlanfromBigEasy 3/28/14, 6:49 PM

In my misspent youth, I found a book with all then known radioactive decay sequences.

Out of the biologically active compounds, Sr90, Cs137 and C14 (only from atomic bombs in the atmosphere, they change nitrogen into C14) are biologically significant after a few years, There are no radioactive daughter products with half lives of years from any other fission product.

The actinides have some long lived isotopes but we do not metabolize them. And there are seven very long lived fission products, but none are biologically active (and their specific radioactivity is very low).

Fission products are surprising few, 5% or 6% Ag108 for example (more on this one later).

<http://en.wikipedia.org/wiki/File:ThermalFissionYield.svg>

Sr137 decays into stable barium 137 within minutes of the Sr137 decay. Sr90 decays into stable zirconium 90 within days of the initial decay.

All of the valuable fission products will be safe within 200 years except Ag 108 (Silver). It has a half life of 418 years before decaying mainly into Palladium 108.

A future society reprocessing/mining used nuclear fuel will have some problems with plutonium. But once past that, all the valuable metals will be good except silver. Some stable, safe silver (Ag107 & Ag109) mixed with Ag108.

I suspect that absent easy access to geiger counters, Ag108 will find it's way into quite a few "coins of the realm" and be carried near the groin.

Otherwise, I fear other heavy metals (lead for one) in the distant future more than spent nuclear fuel.

[Reply](#)



Ruben 3/28/14, 7:07 PM

This comment has been removed by the author.

[Reply](#)



Pinku-Sensei 3/28/14, 8:02 PM

@Pantagruel7

"Pinku-Sensei: are you referring to the "Kuznets Curve?" I've always seen that as an error of scale - a small ripple on the surface of a large wave moving in the opposite direction. Now if you were Pinku-Roshi, maybe I'd have to take you more seriously."

No, I'm not referring directly to the Kuznets Curve, just to the graphs in which the author actually bothered to calculate T from his measures of I (which I find to be very narrow--carbon dioxide emissions are only one of huge number of harmful externalities from energy production), P, and A. None of those actually show a full Kuznets Curve, just the path up to maximum impact. All of the graphs that might show a Kuznets curve look like the effect of regulation, not technological innovation by itself.

As for calling myself Pinku-Roshi, that would be presumptuous. Besides, the only Roshi I know of is the character from the Dragonball comics and cartoons. I find him a dirty-minded joke. Combining that with Pinku would be too much.

[Reply](#)

Boddah Meep 3/28/14, 8:11 PM



@jael

While I completely respect and love the return to horses. And I agree with you about their benefits and cost... (I would love to get one but its not time for me yet, curious what sources you would suggest reading as I begin to go down that path). You mentioned a couple things I take issue with.

1) Is that farming without an animal, or tractor etc must be hard. My argument stems from my interest perennial and tree agriculture, or a more meat based agriculture (where animals harvest a without much man interference. Sure if someone wants to grow 2 acres of tomatoes with a shovel, hoe, basket and sickle then they are not gonna like it. But if you invest the energy for a decade and then do some minor weeding then harvesting is the main work and a horse is not needed. Many perennial crops need more work but the potential already exists and could improve greatly. Its also about what you want to eat. For instance I harvest 4 acres of blueberries and they require absolutely no inputs, they also make maple sugar, acorns, and firewood. They also have filberts, hog peanut, hickory, witch hazel, and winterberry. It can offer much more variety given time and fossil fuels. I think farming needs to be redefined in the coming era.

2) As for this comment " As far as the oft-mentioned problem of manure disposal is concerned, it always seemed to me that only folks with a modern urban/suburban sensibility could really see manure as anything but the gift of fertility it really is" I would only say that there is another drawback. And that is shoveling manure. I would recommend reading Joel Salatin, 'Folks this aint normal' for his opinion of why farmers were so quick to adopt nitrogen fertilizer, (hint shoveling manure). While the farmer might still see manure as a gift, it is also a burden.

Essentially I agree with what you say tho. Half in jest I have been recommending people get horses (for transportation) for over a decade.

[Reply](#)



sunseekernv 3/28/14, 8:51 PM

@Ray - and anyone else doing (green) building:

re: moisture issues, green building

A lot of very informative info at:

http://www.buildingscience.com/index_html

Joe Lstiburek is the founding principle of building sciences, and a great lecturer.

This is a good informative sendup of LEED buildings, FEMA trailers, etc.

<http://www.youtube.com/watch?v=rkfAcWpOYAA>

The location of the vapor barrier is key - and that is climate dependent.

An air:air heat exchanger (Heat Recover Ventilator) or something like point source ventilation may

be needed to move out the moisture while not wasting too much heat.

Good joke about the 90's house - modern day "Potemkin village"

[Reply](#)



sunseekernv 3/28/14, 10:53 PM

@Agent Provocateur - PV economics

It worked, you provoked me into responding...

Note that all renewables are site specific.

Your back of the napkin analysis is missing some information:

- * how much PV capacity did you get for \$20K?
- * how much sunlight do you get? (and when?)
- * what's the array tilt/azimuth/mounting?
- * what's the efficiency of the inverter(s)?
- * any shading issues?
- * ...

You'd have to get an estimate of cost/capacity or do pricing yourself, but it varies a lot by location.

Tracking the Sun will give ballpark system price numbers. \$20K would be about 3.5kWp per Figure 18 on pg. 23 (US prices), but ranges from about 2.8kWp to 4kWp.

<http://emp.lbl.gov/sites/all/files/lbnl-6350e.pdf>

Germany and other places have considerably lower prices.

You can do location specific calculations (for US locations) with some tools from NREL.

<http://pvwatts.nrel.gov>

If you want to do the full costs with amortization, etc., there's the "SAM" tool on that site.

At my location, a 3.5kWp, 80% DC-AC efficient system on a 2-axis tracker would give the 415kWh/month in all months, but not a fixed or 1-axis system. You have to do the work for your location/system.

"PV at breakeven" -

In fact there are many places where PV is at/below "grid parity".

http://www.leonardo-energy.org/sites/leonardo-energy/files/documents-and-links/pv_gpm_2_residential_2013.pdf

You may have missed this I posted a while back: Austin TX signed a deal for 5 cent/kWh wholesale PV electricity, cheaper than wholesale natural gas, coal or nuclear *in that area*.

<http://www.greentechmedia.com/articles/read/Cheapest-Solar-Ever-Austin-Energy-Buys-PV-From->

SunEdison-at-5-Cents-Per-Ki

"PV mature technology" - I was in a room full of PV scientists some years ago, when a poobah from DOE/NREL told us crystalline silicon guys that "silicon is a mature technology, the future is thin film, so don't whine about not getting any grant money." In the 8 or so years since, silicon PV modules went from \$4/Wp to sub-\$1/Wp, and thin film market share went from 20% to 10%.

Module prices have at least another 10-20% to fall, since they're world-wide commodities. BOS prices are very site dependent, but in some places have more fat to cut.

The fossil fuel content of renewables is much smaller than fossil fuel generated electricity.

Will PV/wind/other renewables work everywhere - no.

Will PV... reach grid parity everywhere - no.

Is PV/wind/... working in some places, today - yes.

Is PV... at/below grid parity in some places, today - yes.

Part of the modern world's myopia is due to the fetish for simple answers: fossil fuel helped delude people into that, it *was* so cheap and apparently limitless, and it does work "everywhere" - ah, simple answer! But it's running out. So now we have to think (a lot!) about how to deal with the limitations, economic and otherwise, of renewables - no simple answers.

[Reply](#)



Ruben 3/29/14, 12:34 AM

@latefall

Here is an excellent commentary on Open Source Ecology--paragraph four is particularly clear.

[Open Source Ecology | Five Islands Orchard](#)

While you are on the Five Islands Orchard web page, check out his bicycle powered apple crusher and cider press--it produces something like 60 gallons per hour.

(reposted to correct irritating "autocorrection")

[Reply](#)



Cherokee Organics 3/29/14, 1:01 AM

Hi JMG,

You ask the hard questions!

I'd have to suggest that it appears that they haven't considered the issue at all. We seem to be pursuing the rinse and repeat strategies with iron ore and coal exports as the mainstay.

Seriously, I have trouble even understanding how we could undergo a transition to organic agriculture on a large scale here.

As to a subsidy sink (similar to ITER, but a local example), I think you'll appreciate this article:

[Victorian synchrotron funding veers off beam](#)

In the final analysis, things have to make economic sense. Just in case people dispute that analysis - check this out article as indentured imported labour is back in vogue:

[Call for Asian nannies to reduce childcare costs](#)

I'd love to say I'm making this stuff up!

Hi Agent,

You are naughty! Didn't we have this conversation about PV (photovoltaic electricity) a few weeks back, then a few weeks before that, and then possibly just for good measure, a couple of weeks even before that (and possibly even earlier than that again)?

Honestly it is starting to bore me. From a purely cost based perspective, it costs me AU\$0.83 per kWh to be off the grid entirely powered by PV. Ask yourself how that compares with your bill and the answer becomes obvious.

Incidentally, some commenters here suggest that they have consistent supply from their small PV systems all year. Unless they live near the equator, this point of view is pure rubbish and should be ignored.

Oh yeah, your electricity bill would cost a whole lot more here due to the smaller distributed population and thus more complex (read - more expensive) distribution network. Just sayin - you get cheap electricity.

Your central argument revolves around the assumption that the grid will exist and be stable in the future. It is not a bet that I'm making.

Hi everyone,

There is always a lot of talk about repurposing grid connect PV panels. Well, it may just interest you lot to know that most 72 cell (usually 6 cells x 12 cells) are perfect for 24V off grid solar applications.

Now, unfortunately most extra low voltage appliances are for 12V and putting in the higher voltage will result in some melted plastic and smoke.

But you can purchase now DC to DC converters which can take anywhere between say 36V to 19V and convert it to a stable 12V output perfect for those appliances.

This means you could theoretically power them directly from a solar panel. I'm testing one of these items shortly and will let you all know how it goes.

Regards

Chris

[Reply](#)



sunseekernv 3/29/14, 1:57 AM

@JMG - lots of sailing ships out there that offer classes.

Here's a school ship based in the Netherlands, for 14-17 year olds.

<http://schoolatsea.com/en/de-schepen/details-schepen/>

The Regina Maris was built in 1970.

I also stumbled across this from the Netherlands, an association of 450+ sailing ships, many of which offer classes.

<http://www.vhzc.nl/UK/index3.html>

Lots of links on there, not so many in English.

Closer to you, the Picton Castle is out of Nova Scotia, Canada

<http://www.picton-castle.com>

Though at the moment they seem to be in the South Pacific.

I stumbled on these while trying to figure out Glenn's seeming disparagement of Jonathan's comment re: auxiliary engines in sailing ships.

I've never sailed a big ship, but losing momentum and not being able to come about in time to avoid having to hop out and push off from a sandbar was annoying. Big ships don't push off sandbars so easily.

I find many stories of big sailing ships that are variations on the theme of: "storm came up, ship lost sails or too much wind for any sail, got close to shore, anchor chains broke, wrecked...", with slight variations of "... lost steerageway, and capsized/broke up."

Victims of these themes include the largest pure sailing vessel ever built:

[http://en.wikipedia.org/wiki/Thomas_W._Lawson_\(ship\)](http://en.wikipedia.org/wiki/Thomas_W._Lawson_(ship))

Then there's this ship, almost as big, which lost the forward rigging in a collision, and ended up wrecked because they couldn't steer it and had no engine.

[http://en.wikipedia.org/wiki/Preußen_\(ship\)](http://en.wikipedia.org/wiki/Preußen_(ship))

I'm wondering about the economics for working cargo ships - if having an aux. engine cuts loss rate

by X, and the cost is less than the saved losses, seems like everybody would have one. Of course one has to factor in space/weight/cost for fuel/equipment/specialized crew.

Also, one's insurance rates might be much lower.

An electric motor and batteries might be most reliable when one needs "instant on" full power. Internal combustion engines would be liable to spoilage of the fuel, etc., unless one used fuel fairly often - but that's no good post peak oil. To get out of trouble is typically some minutes to a few hours. Recharge the batteries by "regenerative braking" and/or a windmill.

Electric boats have a long history, the first from 1839!

http://en.wikipedia.org/wiki/Electric_boat

Like the electric car/truck, they lost out in most applications to cheap petroleum based vehicles.

In any case, you're right - here we are, trying to smuggle an engine/motor aboard! But I think safety would be a good reason.

Reply



sunseekernv 3/29/14, 2:30 AM

@jael et. al. - re horse power

Horses have certain advantages in a sustainable world, but I'm always reminded of the equine epizootics of the 1800s.

In the great equine influenza epizootic of 1872, 7,000 of New York City's 11,000 horses got too sick to work, and up to 10% of the sick horses died.

http://en.wikipedia.org/wiki/Equine_influenza

Street railroads were obliged to shut down, fire departments were hampered, business deliveries were limited for months, *sailing ships* sat unloaded or empty - waiting for cargo to move from/to the wharves. What a mess! It spread over the whole US and Canada, and lasted the whole winter.

<http://horsetalk.co.nz/2014/02/17/how-equine-flu-brought-us-standstill>

<http://www.heritagebarns.com/the-great-epizootic-of-1872>

<http://www.lrgaf.org/medical/epizootic.htm>

IIRC - I came across this while reading a book on New York City's garbage. Yep, the garbage piled up too - yum!

One wonders - with a warmer climate, what kind of crazy diseases will spread, especially with

more human/animal contact.

[Reply](#)



SLClaire 3/29/14, 10:19 AM

Hi Redneck Girl,

Thanks for your comment! I have been mulling over the possibility of adding a pair of pygmy goats to the property at some point. We eat a lot of cheese so I'd want them for milking primarily, meat secondarily, and for their manure and ability to eat brush. There's a woman in another suburb of St. Louis who keeps goats and offers cheese-making classes. I wish she offered classes on raising goats as well. Maybe someday she will.

In the meantime, I need to start with a smaller animal, probably bantam chickens, for eggs and secondarily meat, before considering the possibility of adding goats. I hope to begin raising chickens in the next year or two as I read over the info I've collected and plan out the coop and, likely, chicken tractor for them. I've not raised livestock before and only have experience with birds and gerbils as pets, so I have a long learning curve ahead of me.

[Reply](#)



Unknown 3/29/14, 12:20 PM

(Deborah Bender)

@AlanfromBigEasy--Since atomic radiation was discovered by the effect it has on photographic film, perhaps that means of testing will outlast geiger counters. Instant results are not required.

@CherokeeOrganics-- When I have the roof space, I'd like to install an off grid system to power a few conveniences: some lights, a dorm room sized refrigerator, a hotplate or electric kettle, laptop, etc. I don't like to tinker, so the simpler the system, the better. A 24V to 12V DC system sounds ideal.

In direct bright sunlight, how many square feet or meters of photovoltaic cells does it take to power a compact refrigerator with the capacity of a couple of cubic feet? LED lights and most electronic devices don't use much power.

I can see a sizable market for a turnkey system if you could go to the hardware store and buy a sheet or box of PV cells to lay out on a patio, shed roof or driveway, an indoor-outdoor cable, a DC/DC converter and a power strip, and hook the whole thing up like Christmas lights. Then all you would need would be the DC appliances and power cords. I recognize all this depends on the current industrial system, but it would be a very convenient thing to have.

[Reply](#)

Glenn 3/29/14, 12:20 PM



Auxiliary Engines

This is not the forum to argue the minutiae of this subject. While sailing vessels were the example in our host's essay, the point was to examine real costs of any or all given technologies and business models, to see if any worth introducing or re-introducing versus current business as usual. There is also the extent to which any given business model is currently subsidized by society (cargo trucks v.s. trains) and how long that subsidy is liable to continue.

As for my opinions on auxiliaries? It's based on 50 years of small boat sailing, from the Naples Sabot pram I learned on up to crewing on the CLEARWATER. I have no personal square rig experience, though competent handling a dipping lug. This overlaps with 20 years as a Boatswain's Mate in the Coast Guard, 14 of which involved Search and Rescue. Those experiences, combined with the opportunities to learn from internal case studies inform my opinions.

Glenn

in the Bramblepatch
Marrowstone Island
Salish Sea
Cascadia

[Reply](#)



Redneck Girl 3/29/14, 12:53 PM

@ Boddah Meep, I know you were asking Jael but I can't help but put my two cents in. Read all you can about harness horses and horses in general. Your best bet is to find as many people as you can who are long time harness horse users and hang on every word and action when they're handling their animals.

Horses are a very old species, over 50 million years which says they have a LOT of ingrained reactions to their environment and its based on the fact that they are prey animals. They can also be 'accustomed' to otherwise stressful environments or events. Keeping all that in mind with horses, do a lot of observation on their reactions, their body language, that can't be stressed enough! Lean the difference between a horse with a foot cocked in relaxation and one with the muscles tensed to kick!

If you want to buy a horse for riding and/or harness use I would recommend an old fashioned Morgan, if you can find one. They aren't big horses but they are strong, usually calm with good health and long lives. I make the qualification because there has recently been a lot of effort to convert the breed into larger sport horses.

There's a lot to be said for a face to face, 'voice with experience' teacher. If you can only find one. If you can, still do a thorough search for online sources and look for harness events near you. I know in some parts of the country they have a lot of regular events.

As far as manure goes, I have in mind a design for a boarding stable that builds fertility in the soil without ever going off the property. (That's what manure spreaders are for!) My mind works in such

a way as to integrate each aspect of the stable to support the next, in a circle. I'm just too broke to do it!

Wadulisi

[Reply](#)



Mark Rice 3/29/14, 2:16 PM

I recently read [Ninety Percent of Everything](#). This book on the present state of ocean shipping is a good read. These shipping companies have huge ships with small crews to cut the cost per ton. In a desperate measure to cut costs the food on board has gone from bad to worse.

As the price of fuel goes up, we will not be able to ship ninety percent of everything around the world. But when will increasingly expensive fuel put a dent in this?

My "doomer" predictions usually come true but usually much later than I think. When the "dot com" bubble burst, I entertained the notion of surfing the California real estate market. The thought was to sell the house, rent and wait for the prices to go down and then buy at a lower price. Fortunately the thought of moving seemed too arduous for me to seriously consider this course of action. I would have lost my shirt.

As Joseph pointed out, Captain Erikson was way too far ahead of the curve. But some other investments may be behind the curve. The widening of the Panama Canal may be an idea whose time has come and gone.

How can we tell when it is time to build sailing ships? The oil companies will tell us the oil will be inexpensive forever. They want us to be locked in to buying oil for a long time to come.

I though hydro-facking would keep us on this \$100 per barrel plateau for another 5 years. Recent declines in investment and drilling by the oil companies, and recent drops in extraction from these fracked oil fields lead me to think that for once my thinking is behind the curve instead of ahead of it.

[Reply](#)



Elizabeth Forest 3/29/14, 7:09 PM

This has been an interesting read this week. I live in the Great Lakes region, and grew up on sail and motor boats, now experimenting with kayaks for both inland lakes and rivers and open sea kayaks for out in the big waters. I can remember sitting out at the big shipping docks up in Marquette, in the upper peninsula of Michigan, watching the storms roll in across Lake Superior and imagining what it must have been like to be on one of those giant cargo ships. That's a mighty big deep lake up there, and those storms are no joke.

Hemp is the perfect crop for the future of agriculture and industry . Not only can it be used for rope and linen (for sails), it can be planted to leach toxins out of the soil. I have heard of bioneers

in urban settings planting sunflowers and other plants to leach out heavy metals, the plant parts are incinerated in kilns, and the metals are able to be disposed of properly. I read that hemp has been planted around Chernobyl with the same intention, to draw the radioactive toxins out of the soil. I'm sorry to say I don't remember what they do with the hemp at that point, burning it doesn't seem like a logical thing to do with radioactivity.

Back in the early 2000's a friend of mine who used to work at High Times magazine informed me that some of these plant science companies were trying to genetically engineer hemp, and he didn't understand the reason. Of course, I explained that that would be so they could patent the specific gene, which when found in other "wild"cultivated hemp plants could then be claimed as their own. We saw how Monsanto did that with Percy Schmeiser up in Canada. It is my bet that if something has been added in the US Farm Bill about hemp that there is a GMO to be introduced in our future. Plants have really only been genetically engineered to withstand massive doses of chemical pesticides and herbicides, so my guess is that is what they would be genetically engineering hemp for too (follow the money, the same companies make the poisons that make the plants)(that make the drugs to balance out the people whose endocrine system had been disrupted by the poisons sprayed on the plants and produced by the GMO plants themselves), but hemp doesn't need anything to grow, grow, grow. With as many ex-Monsanto executives working in Washington, there is some grease on the GMO wheel.

[Reply](#)



Elizabeth Forest 3/29/14, 7:09 PM

I wonder if hemp can be baled like straw, and used as cellulose insulation in future and retrofit construction. It is amazingly resistant to molds, which is one of the reasons it was perfect to make sails from it. This would also be a benefit in insulating houses, I imagine. I think about insulation a lot- I currently live in a cinder block house on a cement slab- perfect for Florida, but not so good in Michigan. It was built back in the 1950's, when power was cheap. This winter has been a doozy, very long, lots of snow and extreme cold weather for an extended period of months- very expensive. I don't have an electric dishwasher, clothes washer/dryer (I have a wonder wash and clothes line), or much else. Record player/radio and a laptop. Some lamps. A space heater and electric mattress pad for the bedroom. I am not very wasteful, other than living in this cement sieve.

Living in this part of the Great Lakes region, we have lots of fresh water, which much of the world is lacking. Hopefully the many nuclear power plants on the Lakes can be decommissioned and the waste contained, although I'm not very hopeful that this will happen in a timely manner. Just a few days ago an oil spill happened in Lake Michigan near Chicago. Palisades nuclear power plant has small emissions into the waters of this same Great Lake. And there is close to a dozen or more of these nuclear power plants scattered around most of the Great Lakes- Superior is the only one free from nuclear power. It is also the highest of the # Great Lakes touching Michigan, so I have some hope that the cleanliness can be somewhat protected if needed by shutting down the locks in Sault St. Marie.

I don't understand the wanton destruction of the very resources we need to survive.

[Reply](#)**Agent Provocateur** 3/30/14, 6:59 AM

@Sunseeker

Sorry, I had to do it. I'm sincerely interested in determining if PV is economic here or anywhere else. Call me perverse, but I knew it would call you out to provide some numbers if you could. Thank you for the links and your thoughtful reply. I took a good look at the links as well as your comments.

Both your comments (3.5 kWp was key) and the links allowed me to do the numbers in more detail. I am persuaded by these that I was correct for my location (southeastern Ontario - I had to use locations in upstate NY, but these would be close enough). By the calculator you linked, PV would come in at about 2 ½ times the cost of grid power here. That answered my first question: Q1) "How far would grid costs have to go up, or PV capital costs have to come down, to breakeven?"

I suspect the costs assumed in the calculator was conservative: Tax? Regulatory fees? Financing? Plus, one has to factor in your own labour and the "piss off factor" when you have to fix it yourself or the supply is intermittent. Even still, I am persuaded that PV may be economic where the climate and latitude are favourable and local grid rates are very high.

Nonetheless, neither of these conclusions are my main point. I wrote:

"My basic point: if PV is not economic now, I'm not sure it will be in the future. In the event of the end of a national or regional power grid, one needs to look at what electricity is really needed for."

This relates to my second question: Q2) "Are these changes likely?"

Here are the numbers: Lets say you are right and grid power is more sensitive to the rise in the price of oil than PV. Lets take the extreme case of: the ratio of PV to grid rates being only 2 ½ for me and no price rise in PV. Lets make this even more extreme by having grid prices rise at the same rate as oil prices. In this very unlikely case, oil prices would rise by a factor of 2 ½ before grid parity. Is this remotely likely. A2: "No". The world economy would crash due to high oil prices before grid parity occurred in my location. An economic crash would lower oil and so electrical grid prices thus preventing grid parity for me.

Thanks again,

Dave Coulter

[Reply](#)**Agent Provocateur** 3/30/14, 7:03 AM

@Cherokee

Chris,

Ya. I knew I was putting my foot in it. It was a deliberate challenge. I wanted the numbers and Sunseeker delivered. Are they good numbers? Well they were in the ballpark of what I guesstimated even if the calculator costs are low as I suspect they are.

Sorry if you smelled what I stepped in.

As our dollars are on par, your PV rate is 4 times the rate I pay for grid power. Yes, our power in Ontario is very cheap. I like your point about PV being intermittent anywhere but near the equator. I think another commentator mentioned the impossibility of power always being available with PV alone. Essentially the same point. In my case, I'd have to ask myself why I would pay more for less.

You indicated: "Your central argument revolves around the assumption that the grid will exist and be stable in the future. It is not a bet that I'm making."

No. I don't make that assumption. In fact I'm quite certain national/regional electrical grids will fail; hence my reference to hauling water by hand in my comment to JMG. That comment was really all about this seeming contradiction: PV is not economic (in most places) now and will not likely be later even up to the point when the grid fails. I gave my reasoning to Sunseeker above using the numbers he made available.

Lets look a little at how the grid might fail; after all, the end of the electrical grid in a given region might be a convenient point to date the end of industrial civilization in that region. I think we will see the end of a national/regional grid coming a long way off. I expect to see electrical grid rates going up until producer revenues drop or they go higher. The political limit may be reached well before that point. To cut producer costs, we can also expect rolling scheduled blackouts. Finally we will see (more and more) government subsidies to keep the producers solvent until the government itself defaults. Before default we will see (more and more) currency devaluation to keep governments solvent. National/regional grids may even survive multiple sovereign defaults. There need not be a dramatic end, just a gradual withdraw of services. Scheduled blackouts will progress until its always black. Remote rural areas will be permanently blacked out first. Such "no power zones" will grow until finally only the large cities have (intermittent) power. Such is life in parts of the third world today.

OK, say now I live in one of the black (or brown) zones. Would that I had bought a PV system when they were available! Maybe. Those with such systems will have them working until the first essential component that cannot be replaced fails. The part cannot be replaced not because it does not exist, but because it can't be paid for by anyone who is not very rich. Those who run the national/regional electrical grids have deeper pockets; indeed, they are on intimate terms with the people who print the money. Could national/regional electrical grids outlast many smaller local or household systems? If its matter of financing, I think the answer is yes.

JMG hinted at a niche market for small 12 volt systems patched together from the castoffs of larger systems now unserviceable. I think he's onto something there. It would be part of the salvage economy. Such simple PV systems probably have a future after the grid.

So there you have it. Enjoy it while you can while making plans for when you can't.

Cheers,

Dave Coulter

[Reply](#)



Renaissance Man 3/30/14, 7:37 AM

Lots of points about this post and comments excite my thoughts. As usual, it'll take all week to go through them all. Although I personally hate sailing, because if you don't get along with everyone on board, you're pretty-much stuck and very miserable. A seven-day sea voyage in a barquentine left me both loving the idea of ships, loving the excitement, and yet absolutely hating the confinement. I'll stick to horses, at which I've very, very good.

Two historical asides

First: A pineapple was a popular ornamental decorative theme during the late 18th early 19th centuries as a symbol of wealth and prosperity. You can see it cast in door-knockers, carved as finials on bannisters, &c. It was an expensive commodity that was brought in by ship about once a year, therefore, it became a status symbol. It would be placed as a centrepiece in the dining room before being eaten at a dinner party.

Second: "That's why Winston Churchill, as head of Britain's Admiralty, ordered the entire British Navy converted from coal to oil in the years just before the First World War..."

That's also why the British Army launched the promptly-forgotten, 1915 Mesopotamia campaign up the Tigris & Euphrates rivers in Iraq against the Ottoman Turks: to secure their access to the BP (orig. British Persian) oil fields in Iran. Already oil was a vital commodity.

And one footnote: There is a 1927 movie called "The Lost Patrol" -- about a troop of British Cavalry who are massacred by the Bedouin -- set in that campaign. The star of the movie, ironically, served in the British Cavalry in Mesopotamia.

[Reply](#)



Jael Edgerton 3/30/14, 8:07 AM

All, please excuse a little brevity in my postings as my only internet access is via "smart" phone! @Boddah Meep... I commend you for your interest in horsepower and while i can't think of any books to recommend offhand, I do suggest you check out Rural Heritage magazine which is a great general source for anyone interested in draft power. For myself, I am very lucky to live adjacent to Ohio's Amish country and to be married to a man who was raised by his Irish immigrant great-grandfather on a farm that still used horsepower. So I'm very blessed to learn from mostly live human resources, at least when it comes to horsepower. I agree with you that ag techniques need to change and transitioning toward a more permacultured approach will be part of that. If I can manage to purchase the farmstead we rent, forest gardening will be a big part of our future approach. At the same time, I am very curious as to whether you get all your calories from

perennial or foraged sources, and whether the same applies to your animals. I personally haven't been able to eliminate grain from our diets, and I don't see how my fiber animals or meat rabbits could possibly have made it through a winter as cold and snowy as this one without supplemental hay and grain, even if we had limitless forage access, which we don't.

@Sunseekernv...

I wasn't aware of that particular incident. Thanks for bringing it to my attention. I don't doubt that such circumstances will continue to be a future problem, as they often are anytime humans and other species are crowded unnaturally together in a limited space.

[Reply](#)



AlanfromBigEasy 3/30/14, 8:15 AM

Cherokee,

Your previous post had a logical fallacy in it.

You compared a grid isolated PV system (more expensive inverter, adequate batteries) to grid power. What you should have compared was grid connected PV with grid power. Just the panels pumping juice into the grid when the sun shines - what is the cost per kWh then ?

That is the relevant number.

If you assume that there will be no grid, then the price of grid power is simply irrelevant. It is not there.

Then you need to compare the value of electricity vs. no electricity vs. the cost of a grid isolated system.

Power for a 7 or 10 watt LED bulb at night is very valuable. Power to toast some bread, not so much.

[Reply](#)



Shane Wilson 3/30/14, 9:26 AM

Re: nuclear,

I'm wondering after a few meltdowns, once it's apparent that nuclear plants can't be maintained, if there will be a last ditch effort at deep sea disposal of the remaining waste. Putting nuclear waste in the Marianas trench has it's own hazards, but, by that time, will it seem like the lesser of two evils, once wide areas of arable, formerly populated areas are rendered uninhabitable?

I'm thinking that once the dust settles from the next round of catabolic collapse, once the American empire and it's infrastructure has collapsed sufficiently, that sail and other technologies will come to the fore. Is this the whole systems/bigger picture, that enough of the current system must be destroyed, via war, insurrection, etc, that less intensive methods can get a toehold where they're currently shut out by the current order?

I just put my intro in on Green Wizards, and put my tack on the map, disappointed to see there aren't any Green Wizards in KY, we do have Wendell Berry, after all, and quite a natural history. It

all seems daunting when you're new to it, but action is key...

Shane

[Reply](#)



LewisLucanBooks 3/30/14, 9:28 AM

My Dad (Volga-German background) uses a German word I'd like to see get more use. It applies to this post. The word is "Mechaniker". The definitions I see usually define it as a mechanic. I always got the sense that when Dad used it, it was more like "tinkerer." It had more the sense of a basement or backyard inventor. A shade tree mechanic.

An interesting magazine (more like a newspaper) is "Farm Show." (www.farmshow.com.) Lots of adaptations and salvage projects of useful things around the farm. Sent in by the readers. Also reviews (good and bad) of different products and machines. But, so much more. The last issue had two articles on heritage wheat and other grains. And, where to get seed.

As to water transport, a few years ago I saw an article about moving produce and grain down the Willamette River. For those outside the Pacific Northwest, the Willamette flows from far south in the Willamette Valley (some of the richest farmland in the world) to Portland, where it joins the Columbia River.

Unfortunately, the Willamette Locks at Oregon City have been closed. Another example of failing infrastructure and not enough money to fix it.

[Reply](#)



Dennis D 3/30/14, 11:57 AM

As a grid tied, battery backup PV owner (5.8Kw nameplate) I want to add in a few bits. If you had \$20,000 to spend on PV and BOS, and a suitable site for it, it has other benefits. One, it is an insurance policy against what the lack of cheap grid tied electricity buys you, as in burst water pipes in freezing conditions, of refrigeration/freezing of food in hot conditions, or running pumps during floods. Second, the financial system is being increasingly recognized as a crooked casino, and unless you are one of the connected ones, your money is at risk of theft, either outright (MF Global, Cyprus and so on) or simply inflation. Right now, my system produces about 25Kwh a day, in central Alberta. Every dollar of electricity I produce is \$1.50 of earned income I do not have to make, due to the tax free nature of the production.

[Reply](#)



Jael Edgerton 3/30/14, 1:02 PM

Also @Boddah, don't forget that ag produces many more products than just calories... think fiber (hemp, flax, wool, cotton) and oilseed (rape, sunflower, etc) for instance. And consider also that even in a much simplified society there is generally a certain echelon that does not produce these things but relies upon the farmer to do so. And this is all labor intensive, not just in the planting and harvesting but in the processing as well, and there are many ingenious machines that can do

these jobs using the muscle power of a good strong horse, and little else.

[Reply](#)



pintada 3/30/14, 2:08 PM

Dennis D - "As a grid tied, battery backup PV owner (5.8Kw nameplate) I want to add in a few bits. If you had \$20,000 to spend on PV and BOS, and a suitable site for it, it has other benefits. "

I too have a significant amount of PV, and am a firm believer in the benefits especially as mentioned by Dennis as a capital investment. Perhaps someone can help with the obvious issue that owning this stuff brings up, namely:

If I loose my charge controller (for example), the entire thing is useless. My lifestyle suddenly goes from "US comfortable" to zero. I won't even be able to pump water! The inverters will inevitably fail due to a big solar storm, or just age. What to do?

[Reply](#)



Phil Harris 3/30/14, 3:27 PM

@Elizabeth Forest

You ask about hemp: (saving money on heating energy using durable materials is 'a very good isea').

There are now a good number of buildings using hemp in one form or another in UK & Eire. I have physically helped in application of hemp to two 'retrofit' domestic buildings. One project used two methods. One was hemp shiv cast with lime on site for major new wall partitions and, more simply for one purpose, stuffing large existing cavities behind wood panels in an old barn with unprocessed whole-hemp harvested and dried and sprinkled with borax for fire deterrent.

A very useful feature of hemp when cast with and protected by lime is its hygrothermal properties which add to its insulation value. "The breathable wall".

Google hemp building materials uk

In one of the results there is a report with excellent pictures of recent buildings made with hemp and other cellulose materials, and discusses many interesting technical details.(free registration needed to see pdf file).

<http://www.nhbcfoundation.org/Researchpublications/Cellulosebuildingmaterials/tabid/593/language/en-US/Default.aspx>

best

Phil H

[Reply](#)

Unknown 3/30/14, 5:41 PM



(Deborah Bender)

Every year, public libraries and other organizations in my county choose a single book which people are encouraged to read; free discussions and events relating to the book take place in the spring.

This year's title is about urban farming, *Farm City* by Novella Carpenter. It's a memoir, not a manual. This young couple planted most of their farm (with belated forgiveness/permission of the landowner) as a squat on a vacant lot in a fairly sketchy part of downtown Oakland, California, handy to the freeway. They raised fruits, vegetables and livestock (bees, poultry, rabbits, eventually a pair of pigs). They fed the pigs with frequent dumpster diving outside the better restaurants in Oakland and Berkeley.

A lot of their supplies and equipment were salvaged or repurposed. They shared and bartered their produce with their equally low income neighbors. The incidents in the book include slaughtering the meat animals, predation, trying not to annoy the neighbors, the informal economy, seeing what it would be like to eat solely what you can raise yourself or barter for.

The book is relevant to several topics JMG has covered in the past few years, including strengthening community, making use of surplus while it's around, and learning practical skills. It's a quick read and available as an ebook.

The link below is a listing of discussions, lectures and workshops in Marin relating to the book. Most have already happened; I got onto this late.

[Farm City OneBookOneMarin](http://www.onebookonemarin.org/events.html)

<http://www.onebookonemarin.org/events.html>

[Reply](#)



latheChuck 3/30/14, 7:08 PM

pintada: regarding the possible failure of your charge controller... I've read that the typical warrantee on PV cells is 5 years, but on the controller only 1. The weak point of the charge controller is (IIRC) the electrolytic capacitors, and I was astounded to read in an electronic supply catalog (Mouser) figures such as "Endurance: 1000 hours @ 105 degC" or "Endurance: 2000 hours @ 85 degC". 2000 hours!?! That's just one "work-year" (50 wks * 5 days * 8 hours).

According to a Panasonic application note, capacitor lifetime doubles with every 10 degree reduction in operating temperature, so:

Life (actual) = Life (rated) * 2 to the $((t(\text{rate}) - t(\text{actua}))/10)$ power.

So I guess it's important that you minimize the operating temperature of your charge controller! Don't leave it exposed to the sun; don't hide it in a hot and stuffy attic. It's going to generate some heat internally, so don't expect the "actual" temperature to be the ambient temperature around the controller. Now, the guy who installs it is going to get paid when the job is done, wherever he puts it, so it's up to you to decide where it can be kept the coolest to last the longest.

(Note to self: derive a process for controlling battery charge using only manually-operated switches and resistors. "Charge Controller" may be an occupation of the future. Maybe a bimetallic thermostat will be part of the design.)

[Reply](#)



greatblue 3/30/14, 9:35 PM

It might interest some of your readers to know that there are apps for slide rules. One of the free ones in the App store is called Slipstick. The two apps I installed look like and work just as their analog versions do. Touch screens make it easy to mimic the way slide rules work in the real world. Any one who wants to interest the younger generation in steampunk calculators might like to check a few of the apps out. The skills learned would be the same and very few young persons are ever without their smartphones...

There are a ton of abacus apps available too.

Cheers!

[Reply](#)



Phitio 3/31/14, 2:09 AM

The return of sailboats for commerce is a really safe bet. This technology is easy and really resilient. Together with the satellite tech (to watch for the large scale weather) is like a perfect combo. Most probably we will witness this return earlier than we think.

[Reply](#)



Cherokee Organics 3/31/14, 2:17 AM

Hi Deborah,

Thank you for the most relevant and interesting question on solar electricity that has ever been aired on this forum. Well done and respect.

Your question exactly describes my original and small 12V test solar power system here which was built for exactly the same reasons.

The response to your question will require photos and exceed the limited space allocated to comments here (plus it is way off topic). Therefore, I will endeavour to write an article (or series of articles) showing exactly how to do what you are asking.

You know, in natural emergencies people always look to fossil fuel powered generators for electricity and down this way - every single time - they run out of fuel.

A small self-contained solar power system can provide so much resilience and comfort at a time when it is a luxury to have access to energy.

Hi Agent and Alan,

I have no beef with either of you and both of your replies are cogent and both accurate. However, I do not know how to make myself any clearer in this form of Internet dialogue, so at the risk of receiving a long winded reply, I will repeat myself:

Grid connected solar photovoltaic (PV) systems will NOT produce a single watt of electrical energy in their current forms if the grid is not active. Yes, it is that simple.

It is a dead giveaway that the reason that people discuss these grid connected PV systems in terms of payback period is because all those systems can ever achieve is a cost savings on your electricity bill (perhaps some people may be able to earn some cash due to social policy). As such they are an economic tool, perhaps a social statement as well and nothing else.

Without adapting a PV grid connected system to something else altogether those systems cannot do anything else at all (maybe provide a funky roof for a chicken shed?).

It is a difficult concept for people to swallow because it challenges their dominant narrative and I'd sincerely ask that you consider those preceding comments before replying.

None of what you are saying is wrong you are simply ignoring the fact that a resilient system is not an efficient or economic system.

Regards

Chris

[Reply](#)



Mart 3/31/14, 4:21 AM

The IET posted an article [Sailing hybrids - The shape of ships to come?](#) a while back. Of course there's talk of biomass and other nonsense, but it's a start.

I also stumbled across [opensourcemachinetools.org](#) recently which you may like, if you haven't seen it before.

[Reply](#)



Lance M. Foster 3/31/14, 7:15 AM

JMG and all, I am far from any ocean, yet right on the Missouri R. Flatboats with sails and oars and then then steamboats were the things here. Has anyone thought about redeveloping ideas for efficient steamboats in addition to sail?

I am living on our reservation now here in the borderlands of Kansas and Nebraska, and work on our tribal cultural and historic preservation issues, and developing more community centered around those two things. We established a small tribal museum in an old rock building (small building from the WPA era) and I see it as our seed or incubator to preserve the best of our own traditional ways of life with the best in western education and sustainable technologies we are going to need in the long decline. We have a community garden as part of our cultural duties right next to the museum, in its third year.

I have read your blog pretty much since you began it, and have always thought about a place that might be able to be developed into kind of a monastery-educational place-refuge for the future and so this is the direction I am nudging us towards. Luckily several other people here see it the same way :-) At least we have a chance and are going to make the best of things we can...

[Reply](#)



stefimker 3/31/14, 7:49 AM

For people trying to fulfill the niche of sailing cargo ships go to <http://lucyandthenewdawntraders.com> and my interview of her here <http://www.mixcloud.com/21stCenturyPermaculture/28april2013/>

[Reply](#)



thrig 3/31/14, 8:30 AM

Continuing from last week on tree burning, and this week for ships and other such uses for trees, how to manage the forests? Of the means to regulate: law, markets, norms. The Tokugawa Shogunate did very well, though there were also cultural influences: trees managed years in advance for the rebuilding of the Ise shrine. And that was an isolated, closed market. So: strong laws, strong enforcement, norms in favor of preservation, isolation. Now, across the bigger pond, what happened over much those same years? New laws, new markets, and new norms as invaders basically clear-cut the continent as part of a massive population and resource extraction surge. Laws? Not really, and especially weaker out West. Markets? Open for business! Norms? Well, there were cultures with respect for the land, but they were mostly slaughtered, forced into prostitution, or scooted off to reservations, with Ishi being a notable late exception. So: weak laws, open markets in favor of clear-cutting, and weak norms only strengthened almost too late:

"Uncontrolled logging might have cleared off all the primeval western white pine forests, as had happened with the eastern white pine. Fortunately, the era of conservation intervened" — "Northwest Trees", Stephen Arno & Ramona Hammerly, The Mountaineers Books, 2007, p.7.

Subsequent paragraphs detail struggles with fire management and the blister rust accidentally imported from abroad. Moving forward, future repeats of the Tokugawa model seem unlikely, though hopefully those generations will err more towards preservation than carrying out bad Albigensian Crusade reenactments with regard to their trees. How to get there? On all fronts: laws, respected laws, enforcement of laws; market regulations, taxes, and consideration of externalities; and most important cultivate a culture of respect for the land. Short-term profit-taking and "well I got mine" attitudes will be key problems.

[Reply](#)**Wolfgang Brinck** 3/31/14, 9:01 AM

What I see in much of Jim Kunstler's writing and to a lesser extent here is the wish that we could allocate our wealth differently than we have in the past and still do. Unfortunately, we don't. Economic talk is mostly about getting growth going again.

Politicians are not talking about preparing for shrinkage through a gradual planned retooling of the present system into something more in line with available resources.

If growth in the face of shrinking resources fails then we have to pretend for a while that growth is still happening.

After a while, no one will believe the growth story any more and then what?

The easiest way to restyle an economy is to let it collapse and then sift through the rubble to see what is still useful and what people will still want to pay for and rebuild a new economy from that.

Whether PV panels or whatever else your favorite technology happens to be will be revived or survive will depend on whether it's worth the bother to resurrect all the other technologies that your favorite product depends on. If your favorite gizmo requires 10 separate processes to manufacture let's say, lack of any one will doom your gizmo to oblivion.

This is not to say that industrial processes can't be revived from scavenged materials and machinery left over from the days of oil. It only means that once your legacy x-ray lithography machine stops working you won't be printing integrated circuits any more.

Some industries such as the aircraft industry are required by the FAA to maintain stockpiles of parts to maintain airplanes in use for a certain number of years. But there are lots of consumer goods that have no federal agencies mandating that they be kept working into the future.

What we would need to devolve into a simpler economy in a non-catastrophic way would be a federal agency such as DARPA that instead of looking at an ever more complex future would study what it would take to keep a simpler set of technologies going in the future.

I don't know what the military is doing. Surely they must be aware of future resource and technology shortages, but it seems that they are too enamored of ever more complexity to look at how to do war more simply.

In any case, it is fairly easy for each of us on an individual basis to experiment with what sorts of technologies we can go without but things like sail transport need larger groups of people to fund them even though under present conditions they might not be economically competitive.

My own favorite outdated technology is the construction of small skin on frame boats, something that I can do without much of a supply chain or complex tools. I have built dozens of these boats and they are both good and useful, but their main shortcoming is that they need a skin which given the shortage of sea mammal hides and the laws against harvesting them mean that I have to use woven cloth of some kind to cover them. If these boats would have to be covered in homespun cloth, would the cost and effort of creating the homespun be low enough to justify the building of this kind of boat? I don't know. For a few decades it might be cheaper to build small boats out of salvaged construction materials. In any case, the exercise of simplicity keeps the mind nimble.

[Reply](#)**Steve Morgan** 3/31/14, 1:05 PM

While Capt. Erikson held out as long as he could, it seems the economic tide was too strong for sail

freight. As a parallel to your previous point that non-economic forces like religion can shepherd valuable technologies and knowledge through straits, the movement for historic preservation of tall ships in the US (and worldwide, apparently) has done something similar. Just last summer, many ships participated in a reenactment of the Battle of Lake Erie to celebrate its 200th anniversary. Such voluntary enthusiasm should go a long way toward preserving skills and knowledge for sailing and maintaining non-economic vessels for at least some time to come.

There's a list of participating vessels (including some along the Great Lakes @Adrian) at www.sailtraining.org I've had the pleasure of cruising on Lake Michigan on one for an hour or so, including the obligatory stint at the helm. It was quite something to physically feel the power of that many square feet of canvas in the gentle breeze!

As to the question of how to deal with sea level rise swamping ports and causing difficulties with on- and off-loading cargo, it seems like [Old Stormalong](#) solved that problem long ago: just unload the cargo onto smaller boats with a shallower draft. Of course that will require more human effort than offloading multi-modal containers from giant stack ships, but it ought to give people something useful to do.

@Agent, Chris, etc. about PV

The grid-tie vs. off-grid debate has its place, but I just want to point out a hybrid that some might find of interest. At least one company is offering a [typical grid-tied PV system](#) with an adjusted inverter. With just a bit of extra wiring, it seems they after-market converted a very common inverter with an auxiliary output for when the grid is down. The nameplate output takes a big hit, but the system still cranks out 120V AC power whenever the sun shines. While it's not a silver bullet or anything, it looks like a relatively affordable and useful middle ground between the "grid or nothing" typical PV system and the \$0.83/kWh admittedly vulnerable battery backup systems with byzantine electronic complexity.

@Chris re 12VDC

"Therefore, I will endeavour to write an article (or series of articles) showing exactly how to do what you are asking."

Please do. I'd love to read such a series, as I'm sure you've got some great insights that would be really useful for novices like me.

[Reply](#)



Myriad 3/31/14, 1:07 PM

@Cherokee

I too am interested in those details of a low-capacity off-grid system, to reality-check my own plans against.

During a recent five-day blackout (caused by an ice storm) during the some of the winter's coldest days, my wife and I used a single charge of a 400 Watt-hour battery with a built-in inverter. Out of all the possibilities, what we actually used it for was occasional task lighting, to run a few motorized tools for a few precious seconds at a time (when doing the same job by hand would have taken a significant portion of an hour; for instance, pureeing with a kitchen blender), to recharge a cell phone, and for a few minutes (total, not per day) of Internet time. That, plus a few Watt-hours of conventional batteries to run a radio and some small LED lights, made the evenings a lot more manageable.

This was a learning exercise. We had other options (including a fully fueled car) but chose to stick it out. Cooking and what little heat we had was from previously gathered deadwood dug out of the snow from my forested backyard, sawed and split by hand. Unfortunately our fireplace, while usable and actually well-constructed, was designed as decorative. Fortunately, we didn't have to worry about our frozen and refrigerated food thawing or spoiling. And fortunately, we were already invested in good warm bedding.

Anyhow, the point is that a small PV system (say, one square meter, sub-optimally oriented, and the deep cycle storage battery equivalent of two average car batteries) that yielded an average of a half a kWh per day (conservatively) instead, would have meant a luxurious half hour of Internet time every day, more kitchen tools, lighting one room, and recharging NiMH batteries for small devices instead of using up alkalines.

I don't own or want a grid PV system because my house is surrounded by forest so it's not economical while the grid is up. But as a recourse when the grid isn't there, small-scale PV would be more than worthwhile, tree shadows and all. Over time, I can phase out the inverter by making/converting my own 12v devices, as long as I can power my soldering iron. (Unlike Unknown Deborah, I love to tinker.)

Battery durability appears to be the most troubling issue.

[Reply](#)



Dennis D 3/31/14, 1:23 PM

At risk of sidetracking the conversation, I see a bit of education on PV is required. First, as appropriate to this blog, inverters come in more than two flavors. There are Grid only inverters, which shut down if the grid is not there, and the standalone versions, commonly thought of as "off grid", which do not use the grid at all. There is a third category, that are a hybrid. The system cost is more, because they require both batteries and higher tech to interface with the grid. The ones I have, Outback and Xantrex brands, can run their own outputs if the grid is not there (islanding) or synchronize with the grid and sell back, or buy from the grid and charge the batteries. The next issue is what happens if my charge controller dies? You bypass it with a switch, and somebody has to walk by occasionally and see if the batteries are bubbling. If so, turn something on to use the surplus power (pump water/heat water if nothing else) or just shut them off. If your inverter fails, many things can be converted to run on 12 volts, if you don't have scrap automobiles to scavenge from (LED bulbs contain circuit to drop the mains voltage down to 12volts DC typically). The actual panels are just a fancy diode, I have some from the early 70's that are still functioning, and have seen articles on panels that had been shot with a high power rifle and still functioned (not as well

mind you)

[Reply](#)



Unknown 3/31/14, 1:43 PM

(Deborah Bender)

@Cherokee Organics--Thank you for the unexpected compliment. I have immense respect for what you are doing and your way of telling us about it is delightful. I'm looking forward to what you write.

A point of disagreement. Large parts of the southwestern and eastern US get most of their electricity from coal burning. Coal burning has adverse environmental effects beyond CO2: release of soot that causes asthma and heart attacks, acid rain, mountaintop removal, accumulation of huge ponds of coal ash full of heavy metals that leach or are deliberately dumped into rivers. Several major incidents of the latter from a single company, Duke Energy, occurred within the last six months.

Some environmental benefits from cutting back on coal burning are immediate. To the extent that grid-connected PV replaces coal, it probably helps the environment. I say probably because most PV manufacture takes place outside the US and I don't know what damage that causes.

[Reply](#)



sunseekernv 3/31/14, 1:57 PM

@Agent Provocateur - thanks for reading, and being willing to "tinker" with some numbers.

It occurs to me that this subject ought to go to greenwizards.org, as soon as I get approved over there, I'll start a PV economics post.

How did you get 2.5x more costly for PV?

Based on Buffalo NY data, derate of 0.80, and \$5.70/Wp systems, I get 42 cents/kWh for fixed latitude+15 degrees systems, 30 cents/kWh for 2-axis tracker, vs. the 20 cents you said you pay now.

Note I'm using the rule-of-thumb that max winter power is "latitude plus 15 degrees". That may stick up significantly above a roof plane at high latitudes. This also means, in this case another 3cents/kWh just to have a bit more winter power.

The 3.5kWp 2-axis tracker will just net you out over the course of a year.

You are correct that if PV is 2.5x grid power cost, it will never become competitive solely on oil price rises, or at least if/when oil rises 2.5x in price - you're right again, the economy is in ruins. My point was that oil costs don't affect PV that much - note that in 2004 Brent oil was \$40/bbl and PV modules were around/above \$4/Wp, now Brent is \$100+/bbl, and PV modules are sub-\$1/Wp.

But check out figure 12 on page 19 in the LBL [Tracking the Sun VI](#), small systems in Germany are half the cost of US systems. Some of that is scale/experience, some is politics/policy. That already cuts way into the 2.5x factor, at least in those places where it's relevant. My comment about module prices having another 20% drop needs to be seen against Germany's \$2/Wp system prices.

US prices vary significantly by state, see Fig. 19 on pg. 25 for small systems. Maybe Ontario or Canada has some data more specific to you.

PVWatts' assumptions can be seen by the circles with an "i" to the right of the entry fields. "System Type:" says 25 year, 7.5% loan. "Initial cost:" adds \$0.02/WpDC/year for maintenance.

It's real usefulness is that it accesses the actual weather data for the specified site, specifically the sunlight data, and does the math based on system specs (size, derate, tilt, azimuth) to give the expected power output.

Latitude is a big factor:

A 3.5 kWp, .8 DC-AC, latitude+15 degrees fixed tilt system in Buffalo NY gives 3700 kWh/year, the same specs in Honolulu gives 5000 kWh/year.

$5000/3700 = 1.35x$ more power, for the same cost.

It's not just latitude: Hilo (on the Big Island) is farther south than Honolulu, but is only good for 4300 kWh/year. Kona, on the other side of the Big Island at about the same 19.6N latitude is good for 5000 kWh/year. Guess which one gets more rain/clouds? San Diego is latitude 33 N, but has even better sun, 5300 kWh/yr.

So, using 20 cents/kWh in Ontario vs. 40 cents in Hawaii (2x) times 1.35x more sun, still gives PV beating grid parity in Hawaii, even at (high-ish) \$5.70/Wp system prices.

Oahu (Honolulu Hawaii) 2012 average rates were 35 cents/kWh, Hawaii (Big Island) 42 cents, and Lanai 46 cents - for residential - commercial is higher in Hawaii.

[Hawaii average rates](#)

[Reply](#)



wieslermalfünf 3/31/14, 2:17 PM

Dear JMG

I have left another story for your contest at <http://textsofmariou.blogspot.co.at/>
hope you enjoy it
yours mariou

[Reply](#)



C.L. Kelley 3/31/14, 2:44 PM

Greatblue, thanks for the tip on the slide rule apps. I try to stay off the screen as much as possible, but those are a handy learning tool whilst I await the discovery of a secondhand slide rule in one of

the many local junk shops.

[Reply](#)



latheChuck 3/31/14, 4:49 PM

Greatblue- Re: slide-rule (and abacus) apps on smart-phones? I think you're missing the point! We need to preserve the skills AND the artifacts if we're to use slide-rules after the smart-phone era is over. Personally, I have a few PV-powered calculators in the drawer here, as well as a few slide-rules. I usually check my slide-rule work with the calculator, while I still can. I'm quite confident that my PV calculator will outlast any phone/camera/musicbox/calculator/calendar/slide-rule, but the bamboo slide-rule may be the last man standing.

[Reply](#)



latheChuck 3/31/14, 4:56 PM

LanceFoster: re: sail AND improved steamboats? How would you propose to generate steam (if we rule out oil, ethanol, and biodiesel, which would probably be more efficient as internal combustion fuels), and wood or coal, which may be in short supply)?

And why would you think that the prior generation of steamboat architects did not thoughtfully optimize their designs?

I should be careful not to give past generations too much credit, though, for they certainly didn't always optimize the energy efficiency of housing architecture. But still, I doubt that any steamboat operator wanted to burn more fuel than necessary.

[Reply](#)



latheChuck 3/31/14, 5:02 PM

thrig- re: legal/cultural basis for a new silvaculture. At some point, will "tree rustlers" be subject to summary execution, as they say horse thieves were in the Old West? In 2014, I suspect that the legal argument would be "you didn't have to kill them, since you knew who they were, could have them arrested, and had them pay back the value of the trees they had cut". But what's the cash value of a 50-year old white pine that's been groomed for windjammer mast service for three human generations, yet won't be ready to cut for another 50 years? It's not as simple as calculating the board-feet of 2x4 studs that could be milled from it.

[Reply](#)



bcwoodcarver 3/31/14, 7:23 PM

with all the talk about sails I was surprised that there was little or no mention of hemp for sails and rigging. Hemp is going to be the crop of the future and it's byproducts the industry of the future.

[Reply](#)



progress4what 3/31/14, 7:55 PM

Regarding prime timber for masts and ships - Give today's trends and our Druidic host's predictions fifty years to manifest; and there will be PLENTY of prime standing sawtimber to be found on the landmass of today's United States. Just in my own corner of Georgia (US) I have watched 10's of thousands of acres of old family farms grow from open fields into dense pine forests since the late 1970's and early '80's. And with the collapse of the single family (stick-built) market for residential real estate, the market for timber has collapsed as well. It's a bad thing for me and my fellow forest landowners, now struggling to pay taxes and stay afloat - but the trees keep right on growing, even if the economy does not.

Concerning livestock for draft, as well as meat and milk - Does anyone here at the ADR have any knowledge of cattle breeds for multiple purposes? Something like the Devon?

"Cattle from Devonshire had long been recognized in England for their speed, intelligence, strength, willingness to work, and ability to prosper on coarse forage, in a wide range of climates. In later years, other cattle were imported and contributed to the American Devon, which developed as the ideal multipurpose breed. None could surpass it for draft work; the milk was good for cream and cheese making; and the carcass developed fine beef on poor forage."
<http://www.ansi.okstate.edu/breeds/breeds/cattle/milkingdevon/index.htm>

And - to end on a personal note. I enjoyed the exchange between JMG and Joseph N. - both sides. JMG, I understand your anger but, as you say, there is value in non-consensus, and Joseph is far from a divisive new poster.

You have said before that you consider this thread to be like your living room. Perhaps you might find it more useful in the future to consider the discussion thread to be like your lecture hall, instead.

In the question/answer period after a good lecture, contrary views will often be broached, and need not always be forcefully squashed. Just a thought.

[Reply](#)



AlanfromBigEasy 3/31/14, 8:39 PM

As for converting PV solar DC to AC, a motor generator can do that. Run a DC motor on a shared shaft with an AC generator.

Or buy a spare inverter or two when things begin to worry you - enough to last for your remaining years.

And some of the long life AC driven LED lights (Ushio & Archipelago brands) should run off 100+ V DC power as well.

ATM, I feel just a bit foolish buying 25,000 to 50,000 hour LED bulbs given my age of 60. I may burn out one or two, but not most of them. But since I buy good quality bulbs, someone else will

benefit from them.

[Reply](#)



Mark Rice 3/31/14, 8:50 PM

There has been a bit of discussion on the ["NASA" study as reported in the Guardian](#).

First there is the subject of Linear models. These are part of my bread and butter. It is true that the responses of linear systems are sums of exponentials, sinusoids or products of sinusoids and exponentials.

But both the predator prey model and the one from the paper are non-linear models.

I took a course once in non-linear dynamics from a professor from Yugoslavia. I do not remember much except that "a MIG flies like a ballerina".

I also took a breezy course on chaos theory. Non-linear systems can have all sorts of responses including "strange attractors". So almost anything is possible in a non-linear system and non-linear models.

Some parts of nature can be modelled fairly accurately as a linear system. But nature is a non-linear system with feedback.

Then we had a few links to [commentary by a Scott Locklin](#) on the NASA study.

The early part of the Scott Locklin commentary had so much screed it was hard to take seriously. But then later on he did actually dig into the equations. And he was somewhat right in the screed section.

Someone had come up with a fairly simple system of non-linear equations. Someone could have done the modelling in a few weekends using Matlab or Python. This was a low budget exercise.

But then I take a step back and wonder why more of this has not already been done. The interactions of human "civilization" with nature is serious business. It is about time we try to figure out some features of this. Under what conditions does this system oscillate? When does this system have extreme excursions.

You need to start this modelling somewhere. I suspect economists have not done much to allow for physical reality and nature in their models. Most of the economists are still pretending humans are rational.

[Reply](#)



Ruben 3/31/14, 10:36 PM

@Steve Morgan,

Here is a real shanty version of [Mister Stormalong](#). If you like shanties, you could do worse than listen to this guy. He is singing his way through Stan Hugill's shanty bible.

And here is a prettied up folk version.

PAUL CLAYTON "OLD STORMALONG"

I sing a version of this song, and the lyrics of silver spades and golden chains are some of my very favourites.

[Reply](#)



Chris Travers 3/31/14, 11:37 PM

This is an amazing piece and it brings up a lot of thoughts for me, so please pardon the length.

Last December, my family and I took a cruise from Singapore to Thailand and back. It was an interesting experience for reasons I suspect you may appreciate. The 225m diesel-powered ship was capable of cruising at about 15 knots and passed a number of cargo ships that appear to have been going 13-14 knots.

Those numbers struck me for reasons I suspect you may appreciate. 15 knots was probably the speed of the fastest Viking 100ft warships when under sail (the Viking warships, not the clipper ships, now can be seen as the fastest sailing ships of all time), and the Viking cargo ships were capable of 13-14 knots if of similar size. Being on the sea and experiencing the speeds of the sailing ships from around the 10th century was an interesting experience. In terms of length to speed ratio, no older sailing ships (and few ships today) could match the numbers the Viking ships put out. They were truly marvels of engineering.

If you care about the mathematics, the ratio that matters is the square root of waterlength to speed. Usually this is feet to knots. The Viking ships were capable of 1.3-1.5 (feet to knots), while the cruise ship came in at about 0.5, and historical clipper ships came in at about 1.

The second interesting point is that the US navy appears to agree with you regarding bunker oil. In WWII, Japan's fate was decided when they lost the largest naval battle in the war (perhaps of all time), the Battle of Leyte Gulf, which cut them off from oilfields in Indonesia (where I am currently living btw). The US Navy maintains a large fleet of nuclear-powered ships specifically because of this historical lesson: they don't want to be dependent on oil.

There is no chance that civilian nuclear transports are going to ever happen and for good reasons. That leaves the question of what can replace oil. To my mind there is no option other than wind.

[Reply](#)



sunseekernv 4/1/14, 12:17 AM

JMG - I just received a copy of John Perlin's latest *Let It Shine: The 6,000 Year Story of Solar Energy*, the revised and expanded version of *The Golden Thread*.

A more powerful solar engine than Mouchot's was that of Aubrey Eneas, with a 33 foot diameter mirror and output of 15 horsepower. It was used on fellow Englishman Edwin Cawston's ostrich farm in Pasadena, California starting in 1901. It pumped 1,400 gallons/minute from a reservoir 16 feet deep to irrigate the place.

Eneas sold a few of these, but the cost was several times a conventional steam plant.

One was wrecked in a windstorm.
Another had its mirrors destroyed by hail.

At least Mouchot has a wiki entry, Eneas seems even more forgotten.

I thought of another problem using such things on sailboats - even when becalmed, there are often swells that will rock a ship. All concentrating solar devices depend on direct insolation, thus they need accurate pointing and tracking of the sun. One would need at least a massive pendulum setup, if not a gyroscopic stabilizer.

If I imagine a 15 HP outboard motor pushing a thousand ton ship, it seems puny. The [Aaron Manby](#), the first iron steamship, had a 30 hp engine driving a 106 foot (32 m) long, 17 foot (5.2 m) wide ship of 120 tons burthen at 9 knots.

I've thought of rigid "wingsails" with PV to provide auxiliary power, but on an oceangoing vessel, one needs to reef the sails in storms, so there are issues retracting sections into the base.

If one was to have sections of PV panels that one could haul up and hoist like a sail and point roughly at the sun, that would work, especially if one did DC-DC drive. But it would take a lot of them, and one would want to haul them in quickly when the wind came up.

And others have mentioned "what do you do in cloudy/night conditions?"

Those liquid fossil fuels sure are convenient, they'll be missed.

[Reply](#)



[wall0159](#) 4/1/14, 3:14 AM

Hi Cherokee,

(JMG, hope the PV thread isn't too off-topic)

I think a large part of the reason your off-grid system is so expensive is because of the storage that you have set up. I reckon that (in the future, as JMG has alluded) there won't be storage, and we'll just make use of the electricity while the sun is shining.

Eg. don't store power, store what it can do. refrigeration: one can make/buy a phase-change fridge that uses electricity only when it's there, and stores it as "coldness" to be "released" when there's no power. Essentially, think of it as a coldness-battery. The low tech solution is to put several 2 L

plastic bottles of water in a 12 V freezer connected directly to a PV panel, then transfer those to a well insulated box where one keeps one's food.

eg 2. If you want to have pump-pressurised rainwater, have a raised storage tank that gravity feeds, and fill it from a PV-tied pump that runs when the sun's shining.

I'm not (yet) doing this, and have a grid-tied PV system, but I am planning these things..

I do think that off-gridders can be a bit too quick to dismiss grid-tied PV systems. I mean, if we lack the ability to maintain the grid, how will you replace your batteries in 5 years time?
(please don't take this as an attack of any sort -- I'm trying to nut this out, and respect what you're doing!)

[Reply](#)



wall0159 4/1/14, 3:18 AM

Hi Agent, my understanding is that for a grid-tied PV system, the panels cost 1/3, the inverter costs 1/3 and the installation costs 1/3.

ie. if you're happy to just plug a panel (with appropriate voltage regulation) into a suitable device you can probably cut your costs by 50%

[Reply](#)



Cherokee Organics 4/1/14, 3:25 AM

Hi everyone,

Another record temperature day here:

[Near record heat](#)

Regards

Chris

[Reply](#)



sgage 4/1/14, 4:57 AM

@ Mark Rice:

I can't remember the author of this quote, but I invoked it a lot when I was developing models (seasonal patterns of photosynthesis) for my Master's degree:

"There exist systems of such complexity that the only usefully predictive model of that system is the system itself".

Or something like that.

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Courteous, concise comments relevant to the topic of the current week's post are welcome, whether or not they agree with the views expressed here, and I try to respond to each comment as time permits. Long screeds proclaiming the infallibility of some ideology or other, however, will be deleted; so will repeated attempts to hammer on a point already addressed; so will comments containing profanity, abusive language, flamebaiting and the like -- I filled up my supply of Troll Bingo cards years ago and have no interest in adding any more to my collection; and so will sales spam and offers of "guest posts" pitching products. I'm quite aware that the concept of polite discourse is hopelessly dowdy and out of date, but then so are a good many other things we will have to preserve, or laboriously reinvent, on the long road down from Hubbert's peak. Thank you for reading *The Archdruid Report!* -- JMG



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